

PROJECT TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

01005 DESCRIPTION OF WORK
01010 SUPPLEMENTARY REQUIREMENTS
01270 MEASUREMENT AND PAYMENT
01320 PROJECT SCHEDULE
01330 SUBMITTAL PROCEDURES
01355 ENVIRONMENT PROTECTION
01451 CONTRACTOR QUALITY CONTROL

DIVISION 02 - SITE CONSTRUCTION

02080 ASBESTOS ABATEMENT WORK

DIVISION 05 - METALS

05101 METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS
05502 METALS: MISCELLANEOUS, STANDARD ARTICLES, SHOP FABRICATED ITEMS

DIVISION 09 - FINISHES

09900 PAINTING

DIVISION 14 - CONVEYING SYSTEMS

14630 BRIDGE CRANE REHABILITATION

DIVISION 15 - MECHANICAL

15000 MECHANICAL
15995 MISCELLANEOUS HIRE

DIVISION 16 - ELECTRICAL

16050 ELECTRICAL WORK AND EQUIPMENT

-- End of Project Table of Contents --

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01005

DESCRIPTION OF WORK

PART 1 GENERAL

1.1 MECHANICAL WORK

1.2 ELECTRICAL WORK

1.3 STRUCTURAL WORK

1.4 MISCELLANEOUS WORK

1.5 DEFINITIONS

1.5.1 Directed, Required, Ordered, Designated, Prescribed

1.5.2 As Shown, As Indicated, As Detailed

1.5.3 Contracting Officer (CO), Contracting Officer's Representative
(COR)

1.5.4 Government Quality Assurance Representative (GQAR)

1.5.5 Weekend(s)

1.5.6 Project and Powerhouse

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-- End of Section Table of Contents --

SECTION 01005

DESCRIPTION OF WORK

PART 1 GENERAL

This section describes the work required to rehabilitate the existing 500 ton bridge crane at Ice Harbor Dam powerhouse. This section is a general summary of the required and optional work and is not all-inclusive. The crane will be tested and certified at 500 tons.

1.1 MECHANICAL WORK

The Contractor shall design all new components of the system and submit computations and drawings as specified in Section 15000 MECHANICAL. Mechanical work shall include the following:

- a. Clean and visually inspect existing mechanical equipment, replace seals as specified.
- b. Modify existing machinery bases to suit new equipment or furnish new.
- c. Furnish and install couplings and miscellaneous items as required.
- d. At the Government's option, furnish a new spare bridge truck.

1.2 ELECTRICAL WORK

The Contractor shall design all new components of the system and submit computations and drawings as specified in Section 16050 ELECTRICAL WORK AND EQUIPMENT. All electrical equipment shall be replaced including motors, brakes, lighting, controls, wiring, conduit systems, circuit breakers, electrical control cabinets, etc.

1.3 STRUCTURAL WORK

The existing crane operator cab shall be replaced with the open, pulpit type, incorporating a new operator chair and controls, and glass for increased operator visibility as shown on the drawings.

1.4 MISCELLANEOUS WORK

Miscellaneous work for rehabilitation of the bridge crane shall include the following:

- a. Crane inspections shall be performed prior to the commencement of on-site work to determine the condition of the crane and crane rails. See SECTION 14630 for rehabilitation inspections. After all work to rehabilitate the crane has been performed, a final inspection shall be performed to confirm that the crane operates properly and that all deficiencies have been corrected.
- b. Testing shall be performed after all repairs/modifications have been completed.

- c. Training of project personnel shall be conducted at the project.
- d. Perform all work required to comply with the site operations, environmental protection, and safety and health provisions.
- e. Perform all work required to comply with asbestos abatement work.
- f. Perform all work required to comply with lead-based paint removal and disposal.
- g. All required work must be performed by skilled craftsmen.

1.5 DEFINITIONS

1.5.1 Directed, Required, Ordered, Designated, Prescribed

Wherever in the specifications or upon the drawings the words "directed," "required," "ordered," "designated," "prescribed," or words of like import are used, it shall be understood that the "direction," "requirement," "order," "designation," or "prescription" of the Contracting Officer is intended and similarly the words "approved," "acceptable," "satisfactory," or words of like import shall mean "approved by," or "acceptable to," or "satisfactory to" the Contracting Officer unless otherwise expressly stated.

1.5.2 As Shown, As Indicated, As Detailed

Where "as shown," "as indicated," "as detailed," or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provided complete in-place," that is "furnished and installed."

1.5.3 Contracting Officer (CO), Contracting Officer's Representative (COR)

Wherever in these specifications or upon the drawings the words "Contracting Officer" (CO) or "Contracting Officer's Representative" (COR), are used, it shall be understood to also mean "Government" unless otherwise expressly stated.

1.5.4 Government Quality Assurance Representative (GQAR)

Wherever in these specifications the word "GQAR" is used, it shall be understood to mean "Government Quality Assurance Representative," unless otherwise stated.

1.5.5 Weekend(s)

Wherever in these specifications the word "weekend(s)" is used, it shall be understood to mean "Saturday, Sunday and Federal Holidays," unless otherwise expressly stated.

1.5.6 Project and Powerhouse

Wherever in these specifications the word "Project and Powerhouse" are used, it shall be understood to mean Ice Harbor Power Plant.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01010

SUPPLEMENTARY REQUIREMENTS

PART 1 GENERAL

- 1.1 PARTNERING
- 1.2 REFERENCES
- 1.3 SUBMITTALS
- 1.4 EQUIPMENT LIST
- 1.5 TESTING OF EQUIPMENT
- 1.6 PACKAGING, MARKING, AND SHIPMENT
 - 1.6.1 General
 - 1.6.2 Inspection and Acceptance
 - 1.6.3 Accessories and Spare Parts
- 1.7 UTILITIES
 - 1.7.1 Water
 - 1.7.2 Electricity
 - 1.7.3 Compressed Air
 - 1.7.3.1 Telephone
- 1.8 SANITATION FACILITIES
- 1.9 SAFETY
 - 1.9.1 Accident Prevention
 - 1.9.1.1 Safety Requirements
 - 1.9.1.2 Corrective Action by the Contractor
 - 1.9.2 Accident Prevention Plan
 - 1.9.3 Hazard Analysis
 - 1.9.4 Subcontractors
- 1.10 SAFE CLEARANCE (LOCKOUT) PROCEDURES
- 1.11 FIRE CONTROL
- 1.12 WORK SCHEDULES
 - 1.12.1 Contractor's Schedule
 - 1.12.2 Government's Schedule
- 1.13 CONTRACTOR'S STORAGE AND STAGING AREA
- 1.14 PROJECT SECURITY
 - 1.14.1 Vehicle Access
 - 1.14.2 Identification of Employees
 - 1.14.3 Delivery of Equipment
- 1.15 REGULAR CLEANUP AND DEBRIS DISPOSAL
- 1.16 PROTECTION AND RESTORATION OF EXISTING FACILITIES.
- 1.17 CARE OF DRAINS
- 1.18 PROTECTION OF POWERHOUSE FLOORS
- 1.19 CONTRACTOR'S CRANES
- 1.20 AIR PURITY CONTROL IN THE POWERHOUSE
- 1.21 WARRANTIES
- 1.22 DRAWINGS AND MANUALS
- 1.23 MAINTAIN WORKING AS-BUILT CONTRACT DRAWINGS
- 1.24 DISPOSITION OF REMOVED EQUIPMENT

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-- End of Section Table of Contents --

SECTION 01010

SUPPLEMENTARY REQUIREMENTS

PART 1 GENERAL

The work covered by this section of the specifications consists of work common to more than one section of these TECHNICAL SPECIFICATIONS.

1.1 PARTNERING

The Government intends to encourage the foundation of a cohesive partnership with the Contractor and its subcontractors. This partnership will be structured to draw on the strengths of each organization to identify and achieve reciprocal goals. The objectives are effective and efficient contract performance, intended to achieve completion within budget, on schedule, and in accordance with plans and specifications. This partnership will be bilateral in makeup, and participation will be totally voluntary.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

CODE OF FEDERAL REGULATIONS (CFR)

CORPS OF ENGINEERS (COE)

COE EM 385-1-1 (2003) Safety and Health Requirements Manual

Website for the safety manual is www.hq.usace.army.mil/soh/em385/385TOC.htm

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Accident Prevention Plan; G,CD

Equipment List

Safe Clearance (Lockout) Procedures; G,CD.

Contractor's Schedule

SD-07 Certificates

SD-11 Closeout Submittals

As-Built Contract Drawings; G,CD

1.4 EQUIPMENT LIST

The Contractor shall furnish a complete list of all equipment to be used on the project, in duplicate, within 15 days after date of receipt of notice to proceed. The Contractor shall submit a revised list in the event of change of equipment. Lists shall include rented equipment as well as lease-purchase or sale-leaseback equipment. The initial list and the revised lists shall indicate dates equipment is assigned to or removed from the project and adequate identification or description of each item of equipment including manufacturer's name (abbreviated), model number, manufacturer's serial number, year of manufacture, and Contractor's assigned serial or record number.

1.5 TESTING OF EQUIPMENT

Before any machinery or mechanized equipment is put to use on the job, it shall be inspected and tested and determined to be in safe operating condition in the presence of the representative of the Contracting Officer. Cranes or derricks shall be tested by the Contractor or a qualified testing agency in accordance with COE EM 385-1-1. Equipment shall be large enough to safely handle proposed picks or tasks without exceeding the crane rating established by these tests.

1.6 PACKAGING, MARKING, AND SHIPMENT

1.6.1 General

All material and articles shall be prepared and loaded for shipment in such manner as to protect them from damage in transit, and any and all damage shall be made good until the equipment is delivered to the Government at the specified delivery point. The Contractor shall also be responsible for and make good any damages due through its fault or negligence occurring during assembly and testing of the equipment at the powerhouse. Where necessary, heavy parts or machines shall be mounted on skids or shall be crated, and any articles or materials that might otherwise be lost shall be boxed or wired in bundles and plainly marked for identification. All parts exceeding two hundred (200) pounds of gross weight shall be prepared for shipment so that slings for handling by the crane may be readily attached while the parts are on the car or transport truck. Boxed parts, where it is unsafe to attach slings to the box, shall be packed with slings attached to the part, the slings to project through the box or crate so that attachment to the hoisting equipment can be readily made.

1.6.2 Inspection and Acceptance

No material or equipment shall be shipped until after it has been inspected and accepted for shipment by the Government, or unless inspection of the equipment has been waived in writing.

1.6.3 Accessories and Spare Parts

All accessories and spare parts shall be packed separately in containers plainly marked, ACCESSORIES ONLY, or SPARE PARTS ONLY. A packing list, listing the contents of each container, shall be placed in a moisture-proof envelope and securely fastened to the outside of each container. The

packing list shall provide the following information for each spare part or accessory in the container:

- a. Manufacturer
- b. Contract number
- c. Identification, including the manufacturer's drawing number reference

Each spare part or accessory shall be identified so that it can be easily matched against its entry on the packing list.

1.7 UTILITIES

1.7.1 Water

The existing water systems within the dam are available for use by the Contractor for construction and domestic purposes. Temporary piping, if required, shall be installed by the Contractor and shall be removed prior to final acceptance of the work. All temporary piping and connections will be subject to Contracting Officer's approval.

1.7.2 Electricity

Electric power will be made available to the Contractor from the existing electrical systems within the dam and will be supplied without cost to the Contractor. Power is available from existing 120 volt, 1 phase, 15 ampere receptacles, and 480 volt, 3 phase, 30 ampere receptacles. The Government receptacles are located at various sites throughout the powerhouse. Temporary wiring may be required to facilitate the work. The location of all temporary power lines and connections will be subject to Contracting Officer approval. All temporary circuits, wire, extension cords, and devices shall be furnished, installed, connected, and maintained by the Contractor in a workmanlike manner, and shall be removed by the Contractor in like manner prior to final acceptance by the Government. All temporary electrical lines and appurtenances shall be furnished and installed at no additional cost to the Government. Government personnel will have priority use of the electrical receptacles.

1.7.3 Compressed Air

Compressed air at 100 psi up to 20 SCFM will be made available for Contractor use from existing outlets. Government personnel will also use the compressed air at times for routine and emergency maintenance operations. Government personnel will have priority for use of the compressed air.

1.7.3.1 Telephone

The Government's telephone system is not available for the Contractor's use.

1.8 SANITATION FACILITIES

The Government's restrooms inside the dam will not be available for use by Contractor personnel. The Contractor shall furnish sanitation facilities in accordance with COE EM 385-1-1.

1.9 SAFETY

1.9.1 Accident Prevention

In accordance with Contract Clause ACCIDENT PREVENTION the Contractor shall provide and maintain work environments and procedures which will safeguard the public, Government personnel, Contractor personnel, property, materials, supplies, and equipment exposed to Contractor operations and activities.

1.9.1.1 Safety Requirements

The Contractor shall comply with the requirements of COE EM 385-1-1.

1.9.1.2 Corrective Action by the Contractor

Whenever the Contracting Officer detects any noncompliance with these requirements or any condition that poses a serious or imminent danger to the health or safety of any personnel, the Contracting Officer will notify the Contractor and request immediate initiation of corrective action. Lack of notice from the Contracting Officer does not relieve the Contractor from compliance requirements and responsibility. After receipt of notice from the Contracting Officer, the Contractor shall immediately take corrective action. Such notice, when delivered to the Contractor at the site of the work, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for additional costs or damages by the Contractor.

1.9.2 Accident Prevention Plan

Before commencing any work on site, the Contractor shall submit an Accident Prevention Plan for the Contracting Officer's review and acceptance. Paragraph 01.A.11 and Appendix A of COE EM 385-1-1 reflect requirements and guidelines for preparing accident prevention plans.

1.9.3 Hazard Analysis

Prior to beginning each major phase of work, an activity Hazard Analysis shall be prepared by the Contractor in accordance with paragraph 01.A.09 and Figure 1-1 of COE EM 385-1-1 and provided to the Government Inspector.

1.9.4 Subcontractors

Compliance with the accident prevention and safety requirements by subcontractors will be the responsibility of the Contractor.

1.10 SAFE CLEARANCE (LOCKOUT) PROCEDURES

A safe clearance procedure (hazardous energy control plan) is used by project personnel to ensure continuity of service and safety to personnel and equipment. The projects require that the Contractor shall provide the names of two individuals who shall have the authority to request clearances and release clearances. These individuals will receive training at the projects. An allowance for three hours is required to review the project procedures and receive the training. Any work performed by the Contractor that requires taking project operating equipment out of service will be

done only after a formal clearance is obtained through the Contracting Officer's Representative. Only the Project Control Room as arranged by the Contracting Officer's Representative will issue clearances. Contractor personnel shall not violate the clearance procedure. A copy of the Projects Safe Clearance Procedure will be provided to the Contractor. As required in paragraph 12.A.02 in COE EM 385-1-1, the Contractor shall submit its hazardous energy control plan to the Corps for approval prior to initiation of any activities requiring the removal of any project operating equipment from service. Prior to the removal of any project operating equipment from service a meeting and preparatory inspection will be held between the Contractor and project personnel to ensure that all affected personnel understand and comply with the restrictions of each others energy control procedures.

1.11 FIRE CONTROL

Each piece of internal combustion engine driven equipment used at the work site shall be equipped with a fire extinguisher in accordance with recommendation NFPA as appropriate. The minimum approved rating of extinguishers shall not be less than 5-B:C.

1.12 WORK SCHEDULES

1.12.1 Contractor's Schedule

At the prework meeting, the Contractor shall furnish a schedule of working hours and days of the week for contract work. The Contractor shall furnish notification of any change of schedule of regular work hours, overtime work hours, and shifts of work crews and personnel at the site. This notification shall be provided a minimum of 48 hours prior to any schedule change to allow suitable scheduling of Government personnel and inspection. Exception to this requirement may be allowed in case of schedule change due to emergency conditions.

1.12.2 Government's Schedule

The maintenance crews at the dam work from 6:30 a.m. to 5:00 p.m., Monday through Thursday. The administrative staff at the dam works Monday through Friday. Crews and staff do not work on weekends and Federal holidays. A powerhouse operator is at the site 24 hours a day, 7 days a week, including Federal holidays but is not available to assist the Contractor.

1.13 CONTRACTOR'S STORAGE AND STAGING AREA

The Contractor's storage and staging areas shall be at locations indicated or as otherwise approved. The storage and staging areas may be used for activities such as setup of an office trailer, parking of private vehicles, storage of materials and equipment and for work activities. Security at the storage and staging site will be the Contractor's responsibility. Temporary security fencing may be installed in a manner approved by the Contracting Officer. Security fencing may not be installed in a manner that damages existing facilities, such as punching post holes in existing pavement.

1.14 PROJECT SECURITY

The project site is a secured area and access onto the project is restricted. The security measures affect all of the Contractor's vehicles and personnel. There will be delays when entering projects due to locked

gates, vehicle inspections, and personnel checks. Inspections and checks may include inspection of tool boxes, brief cases, lunch boxes, and other containers.

1.14.1 Vehicle Access

Project access roads are secured with locked gates. All vehicles that pass thru the locked gates will be subject to being searched. No privately owned vehicles (POV's) will be allowed thru locked gates. Only Contractor's work vehicles and equipment that are essential to the conduct of the work will be allowed in the work areas. All Contractor vehicles shall display suitable permanent or temporary identification.

1.14.2 Identification of Employees

The Government will prepare an identification badge/card for each employee prior to the employee's work on the project site. All Contractor employees engaged in work at the Government's facility shall display identification at all times. Badges will include photo identification, company name, and the individual's name and company identification number. The Government prepared identification badge shall be turned in to the Contracting Officer immediately upon the release of the employee. Employees will be photographed by the Government. Employees who fail to submit to photographing will not be allowed on the project site.

1.14.3 Delivery of Equipment

Delivery of equipment and materials to the project site shall arrive during the normal working hours of the project maintenance crews described in paragraph WORK SCHEDULES. To the maximum extent possible deliveries shall arrive on the same side of the river as the Contractor's work area. Delivery vehicles will not be allowed to cross the river over the dam. Delivery vehicles arriving on the opposite side of the river as the work area shall be unloaded outside the locked gate, equipment shall be loaded onto Contractor's vehicles, and Contractor's vehicles will then be allowed to cross the dam to the work area.

1.15 REGULAR CLEANUP AND DEBRIS DISPOSAL

Debris resulting from the work, such as packing cases, scrap lumber, and other debris shall be collected and removed from the project site daily and disposed of in a legal manner. All costs for removing debris shall be incidental to the work, and no separate payment will be made therefore. The Government's trash cans, dumpsters, etc. shall not be used.

1.16 PROTECTION AND RESTORATION OF EXISTING FACILITIES.

The Contractor shall take precautions to prevent damage to existing facilities while performing work under this contract. Upon completion of the work, all the existing facilities not included as a portion of the work shall be left in a condition better than or equal to the condition existing at time of contract award. Costs for maintenance, repair and restoration of any facilities shall be considered as incidental to and included in the bidding schedule prices.

1.17 CARE OF DRAINS

Existing powerhouse floor drains shall not be used for disposal of any solid material or any liquids other than clear water. The Contractor shall

demonstrate that the pipes and drains are unobstructed when so directed.

1.18 PROTECTION OF POWERHOUSE FLOORS

Care shall be taken to prevent damage to tile floors within the powerhouse.

Minimum protection shall include continuous cover of three-layer, oil-impervious craft paper over traffic and work areas. Place continuous layer of 3/4-inch-thick plywood on floor areas to receive equipment or stored items. Pipe trenches shall remain accessible even if covered. All designations relating to fire protection equipment that get covered shall be remarked after covering. Provide additional blocking and timbers when required. Also suitably protect other surfaces of work. Damage to floor caused by Contractor's operation shall be repaired at no additional cost to Government. Repairs shall match surrounding area in color, texture, and surface finish and are subject to approval. Work in the powerhouse shall not start until floor protection meets the satisfaction of the COR.

1.19 CONTRACTOR'S CRANES

Contractor's cranes and equipment furnished for this work shall conform to all applicable OSHA Requirements and COE EM 385-1-1. Crane wheel and outrigger loading diagram and deck protection for outriggers shall be submitted for approval at least 14 calendar days prior to using any crane rated 50 tons or more on any of the project decks.

1.20 AIR PURITY CONTROL IN THE POWERHOUSE

The Contractor shall take such measures as are necessary to effect maximum control, and prevent escape to the powerhouse, of all dust and fumes created by operations under this contract. To the maximum extent possible, all dust and dirt shall be removed by vacuum cleaning. At least 10 working days prior to commencement of work in the powerhouse, the Contractor shall submit for approval, in writing, his proposed air purity control program. Air purity control program shall include, but not necessarily be limited to, the following:

- (1) Adequate isolation and ventilation of air arcing, welding, burning, and grinding operations.
- (2) Provision of exhaust ducts that shall discharge outside the powerhouse structure where mechanical ventilation is used.
- (3) Controlled operation of power driven tools.
- (4) Furnishing and removing of oiled sawdust or other dust preventatives in areas that cannot be properly rendered free from excessive dusting by vacuum cleaning or other methods.
- (5) Vacuum cleaning of spaces within the work areas where dust accumulates.
- (6) Air-, electrical-, or battery-driven equipment may be used inside the powerhouse.
- (7) Internal-combustion engine powered equipment will not be permitted to operate inside the powerhouse unless exhausted to the exterior except for short periods of time to unload materials and equipment.

Depending upon the Contractor's plant, equipment, and methods of operation,

additional provisions for satisfactory air purity control will be required and shall be included in the proposed air purity-control program. Decisions of the Contracting Officer as to the adequacy and extent of the air purity-control program and prosecution of the work shall be final and conclusive.

1.21 WARRANTIES

A copy of all manufacturer's standard warranties that are furnished with items of equipment supplied in this contract shall be given to the Contracting Officer. This requirement is in addition to any warranties or guaranties that may be specifically required in other sections of the technical specifications.

1.22 DRAWINGS AND MANUALS

Existing drawings and manuals that may be of value for the work will be available for viewing at the powerplant during normal project day shift working hours. Drawings and manuals shall not be removed from the office. However, one (1) copy of available technical data and drawings not included in the reference drawings will be made at no cost to the Contractor within 7 normal working days after the request for such copies has been made. The drawings and manuals are furnished for information only and the Government does not guarantee the drawings or manuals will match actual field conditions. Reference drawing deviations shall not be the basis for a contract claim.

1.23 MAINTAIN WORKING AS-BUILT CONTRACT DRAWINGS

The Contractor shall maintain a current and accurate record of the work as actually constructed in the form of working "as-built" drawings by marking "as-built" conditions on the contract drawings. Blue pencil shall be used to mark information added to the drawings and red pencil shall be used to mark information deleted from the drawings. Contract drawings shall be maintained on-site during construction. The completeness and accuracy of the marked "as-built" drawings must be verified by Government Quality Assurance personnel prior to submission of progress payment requests. The working "as-built" drawings shall be submitted to the Contracting Officer after all "as-built" conditions have been marked on the working "as-built" contract drawings.

1.24 DISPOSITION OF REMOVED EQUIPMENT

All existing equipment removed and not reinstalled shall become the property of the Contractor, removed from the project site, and disposed of in a legal manner.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01270

MEASUREMENT AND PAYMENT

PART 1 GENERAL

- 1.1 CRANE REHABILITATION AND ACCEPTANCE
- 1.2 CRANE TRUCK REFURBISHMENT
- 1.3 O&M MANUALS
- 1.4 AS-BUILT DRAWINGS
- 1.5 FINAL APPROVED VERSION OF CONTRACTOR PREPARED DRAWINGS
- 1.6 ASBESTOS ABATEMENT WORK (OPTIONAL)
 - 1.6.1 Asbestos Bulk Sampling of Materials
 - 1.6.2 Submittal Preparation for Asbestos Abatement Work, Including Attending Pre-work Meeting
 - 1.6.3 Mobilization and Demobilization for Abatement Work
 - 1.6.4 Disposal of Asbestos Containing Materials
 - 1.6.5 Services of a Certified Asbestos Abatement Worker
 - 1.6.6 Services of a Certified Asbestos Abatement Supervisor
 - 1.6.7 Services of a Certified Air Monitoring Personnel
- 1.7 Lead Based Paint Removal and Disposal
- 1.8 Services of Skilled Craftsmen
- 1.9 GOVERNMENT QUALITY ASSURANCE WELD INSPECTIONS (OPTIONAL)
- 1.10 Trips by Radiographic Inspection Agency (Optional)
- 1.11 Handling for Radiographic Inspection (Optional)
- 1.12 Transportation Services, Equipment Rental, and Parts and Materials (Optional)

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-- End of Section Table of Contents --

SECTION 01270

MEASUREMENT AND PAYMENT

PART 1 GENERAL

In each instance, the contract price and payment for an item shall constitute full compensation for furnishing all plant, labor, equipment, and materials, and for performing all operations required to complete the work included in the item as herein specified, or as otherwise approved.

1.1 CRANE REHABILITATION AND ACCEPTANCE

Rehabilitation of the bridge crane will be measured for payment as lump sum (LS) items. Payment for the Items listed below shall be full compensation for all work required for rehabilitation of the bridge crane, complete, as specified and approved.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>
0001	"Pre Rehabilitation Inspection and Report"
0002	"Crane Rail Realignment (Optional)"
0004	"Bridge Drive Refurbishment"
0005	"Trolley Refurbishment"
0006	"Main Hoist Refurbishment and Wire Rope Replacement"
0007	"Auxiliary Hoist Refurbishment and Wire Rope Replacement"
0009	"Bridge Truck Refurbishment (Optional)"
0010	"Design and Installation of New Cab"
0011	"Post Refurbishment Load Test"
0012	"New Bridge Truck (Optional)"

1.2 CRANE TRUCK REFURBISHMENT

Removal, refurbishment, and reinstallation of the bridge crane trucks will be measured for payment as the number (EA) of bridge crane trucks directed to be removed and refurbished. Payment for the Items listed below shall be full compensation for all work required for removal and refurbishment of the bridge crane trucks, complete, as specified and approved.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>
003	"Bridge Trucks and Structure Refurbishment"
008	"Bridge Truck Removal and Re-installation (Optional)"

1.3 O&M MANUALS

O&M manuals will be measured for payment as a complete pay item (LS). Payment will be made at the lump sum price for Item No. 0013, "O&M Manuals," which price and payment shall be full compensation for all work required for O&M manuals, complete, as specified and approved.

1.4 AS-BUILT DRAWINGS

As-built drawings will be measured for payment as a complete pay item (LS). Payment will be made at the lump sum price for Item No. 0014, "As-built drawings," which price and payment shall be full compensation for all work required for submission and approval as-built drawings, complete, as specified and approved.

1.5 FINAL APPROVED VERSION OF CONTRACTOR PREPARED DRAWINGS

The final approved version of all Contractor prepared drawings will be measured for payment as a complete pay item (LS). Payment will be made at the lump sum price for Item No. 0015, "Final approved version of Contractor prepared drawings," which price and payment shall be full compensation for all work required for submission and approval of all Contractor prepared drawings, complete, as specified and approved.

1.6 ASBESTOS ABATEMENT WORK (OPTIONAL)

1.6.1 Asbestos Bulk Sampling of Materials

Asbestos bulk sampling will be measured for payment as the number of bulk samples taken (EA). Payment will be made at the unit price for Item No. 0016A, "Asbestos Bulk Sampling of Materials (Optional)," which price and payment shall be full compensation for all work required for asbestos bulk sampling, complete, as specified and approved.

1.6.2 Submittal Preparation for Asbestos Abatement Work, Including Attending Pre-work Meeting

Preparation of submittals, including attendance at the pre-abatement work meeting, will be measured for payment as a complete job (LS). Payment will be made at the lump sum price for Item No. 0016B, "Submittal Preparation for Asbestos Abatement Work, Including Attending Pre-work Meeting (Optional)," which price and payment shall be full compensation for all work required for asbestos abatement work submittals, complete, as specified and approved.

1.6.3 Mobilization and Demobilization for Abatement Work

Mobilization and demobilization required for asbestos abatement work will be measured for payment as the number of times (EA) the Contractor mobilizes for asbestos abatement activities. Payment will be made at the unit price for Item No. 0016C, "Mobilization and Demobilization for Abatement Work (Optional)," which price and payment shall be full compensation for all work required for mobilizing and demobilizing for asbestos abatement work, complete, as specified and approved.

1.6.4 Disposal of Asbestos Containing Materials

Disposal of asbestos containing materials will be measured for payment as the number of pounds (LB) of materials satisfactorily disposed of. Payment will be made at the unit price for Item No. 0016D, "Disposal of Asbestos Containing Material (Optional)," which price and payment shall be full compensation for all work required for disposal of asbestos contain waste, complete, as specified and approved.

1.6.5 Services of a Certified Asbestos Abatement Worker

Services of a certified asbestos abatement worker will be measured for payment as the number of hours (HR) of abatement work actually performed. Payment will be made at the unit price for Item No. 0016E, "Services of a Certified Asbestos Abatement Worker (Optional)," which price and payment shall be full compensation for all work performed by the certified asbestos abatement work, complete, as specified and approved.

1.6.6 Services of a Certified Asbestos Abatement Supervisor

Services of a certified asbestos abatement supervisor will be measured for payment as the number of hours (HR) of abatement work supervision actually performed. Payment will be made at the unit price for Item No. 0016F, "Services of a Certified Asbestos Abatement Supervisor (Optional)," which price and payment shall be full compensation for all work performed by the certified asbestos abatement work supervision, complete, as specified and approved.

1.6.7 Services of a Certified Air Monitoring Personnel

Services of a certified air monitoring personnel will be measured for payment as the number of hours (HR) of air monitoring work is actually performed. Payment will be made at the unit price for Item No. 0016G, "Services of a Certified Air Monitoring Personnel (Optional)," which price and payment shall be full compensation for all work performed by the certified air monitoring personnel, complete, as specified and approved.

1.7 Lead Based Paint Removal and Disposal

Lead based paint removal and disposal will be measured for payment as a complete pay item (LS). Payment will be made at the lump sum price for Item No. 0017, "Lead Based Paint Removal and Disposal," which price and payment shall be full compensation for all work required for removal and disposal of lead based paint, complete, as specified and approved.

1.8 Services of Skilled Craftsmen

Services of skilled craftsmen will be measured for payment as the actual number of hours and fractions thereof which the services of one or more skilled craftsmen are used. Fractions of an hour will be measured to the nearest quarter hour. Time will be recorded separately for each required workman and combined for payment. Measurement of work time shall begin when the workman reports to the COR for assignment and end when released from such assignment. If overtime work is directed, payment will be on a basis of one and a half times the time worked. Provisions of Contractor supervision, helper labor, tools, and equipment normally available for the performance of the craft work will be considered incidental to the services being performed, and no separate measurement will be made therefore. Payment will be made at the unit price per hour for Item No. 0018, "Services of skilled craftsmen," which price and payment shall be full compensation for the directed work. Skilled Craftsmen hours will not be subject to clause: Variation in Estimated Quantities; only the actual number of hours used will be paid for.

1.9 GOVERNMENT QUALITY ASSURANCE WELD INSPECTIONS (OPTIONAL)

Government quality assurance weld inspections will be measured for payment as the number of lineal feet (LF) of weld actually inspected. Payment, which will be made at the lump sum prices listed below, shall be full compensation for all work required for performing the weld inspections, complete, as specified and approved.

<u>ITEM NO.</u>	<u>DESCRIPTION</u>
0019	"Inspector Radiographic Weld Inspection (Optional)"
0020	"Ultrasonic Weld Inspection (Optional)"
0021	"Magnetic Particle Weld Inspection (Optional)"
0022	"Dye Penetrant Weld Inspection (Optional)"

If the GQAR weld inspection reveals unacceptable defects in the work inspected in accordance with the specifications the cost of the initial test, the cost of repair and handling, and the cost of all subsequent tests shall be borne by the Contractor, and tests shall not be included in the weld inspection quantities listed in (SECTION 05101).

1.10 Trips by Radiographic Inspection Agency (Optional)

Trips from the inspection agency to the Contractor facility or Government work site and back to the inspection agency for Government-directed radiographic inspection will be measured for payment as the number of trips (EA) made for weld inspection. Payment will be made at the unit price for Item No. 0023, "Trips by Radiographic Inspection Agency (Optional)," which price and payment shall be full compensation for all travel costs, including overhead costs, incurred by the Inspection Agency, complete, as specified and approved.

1.11 Handling for Radiographic Inspection (Optional)

Furnishing of equipment and personnel, including overhead costs, to handle material for Government-directed radiographic weld inspection will be measured for payment as the number of hours (HR) that handling work is actually performed. Payment will be made at the unit price for Item No. 0024, "Handling for Radiographic Inspection (Optional)," which price and payment shall be full compensation for all work required for handling of materials for radiographic weld inspection, complete, as specified and approved. The GQAR will certify that the number of man-hours charged is acceptable.

1.12 Transportation Services, Equipment Rental, and Parts and Materials (Optional)

Transportation services, equipment rental, and parts and materials for additional directed work will be measured for payment based on invoices plus a 15% markup. Only additional work, directed in writing, shall be included under this item. Payment will be made under Item No. 0025, "Transportation Services, Equipment Rental, and Parts and Materials (Optional)," which price and payment shall be full compensation for all additional directed transportation services, equipment rental, and parts and materials, complete, as specified and approved.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01320

PROJECT SCHEDULE

PART 1 GENERAL

1.1 SUBMITTALS

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

3.2 BASIS FOR PAYMENT

3.3 PROJECT SCHEDULE

3.3.1 Use of the Critical Path Method

3.3.2 Level of Detail Required

3.3.2.1 Activity Durations

3.3.2.2 Government Activities

3.3.2.3 Bid Item

3.3.3 Scheduled Project Completion

3.3.4 Interim Completion Dates

3.4 PROJECT SCHEDULE SUBMISSIONS

3.4.1 Initial Project Schedule Submission

3.4.2 Periodic Schedule Updates

3.5 SUBMISSION REQUIREMENTS

3.5.1 Schedule Reports

3.5.1.1 Activity Report

3.5.1.2 Earnings Report

3.5.2 Network Diagram

3.5.2.1 Continuous Flow

3.5.2.2 Project Milestone Dates

3.5.2.3 Critical Path

3.5.2.3 Banding

3.5.5.5 S-Curves

3.6 REQUESTS FOR TIME EXTENSIONS

3.7 DIRECTED CHANGES

3.8 OWNERSHIP OF FLOAT

-- End of Section Table of Contents --

SECTION 01320

PROJECT SCHEDULE

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Initial Project Schedule; G,CD

Periodic Schedule Updates; G,CD

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Pursuant to the Contract Clause, SCHEDULE FOR CONSTRUCTION CONTRACTS, a Project Schedule as described below shall be prepared. The approved Project Schedule shall be used to measure the progress of the work, to aid in evaluating time extensions, and to provide the basis of all progress payments.

3.2 BASIS FOR PAYMENT

The schedule shall be the basis for measuring Contractor progress. Failure of the Contractor to provide all information, as specified below, shall result in the disapproval of the entire Project Schedule submission and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes.

3.3 PROJECT SCHEDULE

The computer software system utilized by the Contractor to produce the Project Schedule shall be capable of providing all requirements of this specification. Manual methods used to produce any required information shall require approval by the Contracting Officer.

3.3.1 Use of the Critical Path Method

The Critical Path Method (CPM) of network calculation shall be used to generate the Project Schedule. The Contractor shall provide the Project Schedule in the Precedence Diagram Method (PDM).

3.3.2 Level of Detail Required

The Project Schedule shall include an appropriate level of detail. The Contracting Officer will use, but is not limited to, the following conditions to determine the appropriate level of detail to be used in the Project Schedule:

3.3.2.1 Activity Durations

Contractor submissions shall follow the direction of the Contracting Officer regarding reasonable activity durations. Reasonable durations are those that allow the progress of activities to be accurately determined between payment periods.

3.3.2.2 Government Activities

Government and other agency activities that could impact progress shall be shown. These activities include, but are not limited to: approvals and inspections.

3.3.2.3 Bid Item

All activities shall be identified in the project schedule by the Bid Item to which the activity belongs. An activity shall not contain work in more than one bid item.

3.3.3 Scheduled Project Completion

The schedule interval shall extend from NTP to the contract completion date.

3.3.4 Interim Completion Dates

Contractually specified interim completion dates shall also be constrained to show negative float if the early finish date of the last activity in that phase falls after the interim completion date.

3.4 PROJECT SCHEDULE SUBMISSIONS

The Contractor shall provide the submissions as described below. The reports and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

3.4.1 Initial Project Schedule Submission

The Initial Project Schedule shall be submitted for approval within 20 calendar days after NTP. The schedule shall provide a reasonable sequence of activities that represent work through the entire project and shall be at a reasonable level of detail. Include the reports and network diagrams required in paragraph SUBMISSION REQUIREMENTS.

3.4.2 Periodic Schedule Updates

The Contractor shall submit periodic schedule updates with their monthly progress payment request. These submissions shall enable the Contracting Officer to assess Contractor's progress. Include the reports and network diagrams required in paragraph SUBMISSION REQUIREMENTS.

3.5 SUBMISSION REQUIREMENTS

The following items shall be submitted by the Contractor for the initial submission and every periodic project schedule update throughout the life of the project:

3.5.1 Schedule Reports

The format for each activity for the schedule reports listed below shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float. Actual Start and Actual Finish Dates shall be printed for those activities in progress or completed.

3.5.1.1 Activity Report

A list of all activities sorted according to activity number.

3.5.1.2 Earnings Report

A compilation of the Contractor's Total Earnings on the project from the NTP until the most recent schedule update. This report shall reflect the Earnings of specific activities based on the agreements made in the field. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining Contractor Payment. Activities shall be grouped by bid item and sorted by activity numbers.

3.5.2 Network Diagram

The network diagram shall be required on the initial schedule submission and on monthly schedule update submissions. The network diagram shall depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

3.5.2.1 Continuous Flow

Diagrams shall show a continuous flow from left to right with no arrows from right to left. The activity number, description, duration, and estimated earned value shall be shown on the diagram.

3.5.5.2 Project Milestone Dates

Dates shall be shown on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.5.2.2 Critical Path

The critical path shall be clearly shown.

3.5.2.3 Banding

Activities shall be grouped to assist in the understanding of the activity sequence. Typically, this flow will group activities by category of work, work area and/or responsibility.

3.5.5.5 S-Curves

Earnings curves showing projected early and late earnings and earnings to date.

3.6 REQUESTS FOR TIME EXTENSIONS

In the event the Contractor requests an extension of the contract completion date, or any interim milestone date, the Contractor shall furnish the following for a determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract: justification, project schedule data, and supporting evidence as the Contracting Officer may deem necessary. Submission of proof of delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is obligatory to any approvals.

3.7 DIRECTED CHANGES

If the NTP is issued for changes prior to settlement of price and/or time, the Contractor shall submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The proposed revisions to the schedule will be approved by the Contracting Officer prior to inclusion of those changes within the project schedule.

3.8 OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

- 1.1 SUBMITTAL IDENTIFICATION
 - 1.1.1 Submittal Descriptions (SD)
 - 1.1.2 Action Elements for Submittal Approval
- 1.2 Submittals
- 1.3 Submittal of Shop Drawings
- 1.4 Quantity of Shop Drawings
- 1.5 Shop Drawings
 - 1.5.1 Approval of Shop Drawings
 - 1.5.2 Shop Drawings Approved by Contractor
 - 1.5.3 Shop Drawings Approved by Contracting Officer
- 1.6 General Submittal Requirements
 - 1.6.1 Required Submittals
 - 1.6.2 Submittals
 - 1.6.2.1 Submittal of Shop Drawings
 - 1.6.2.2 Sequence of Submission
 - 1.6.2.3 Single Transmittal
 - 1.6.2.4 Succeeding Submittals
 - 1.6.3 Drawing Dimensions
 - 1.6.4 Initial Submittals
- 1.7 Standard Manufactured Items
- 1.8 Trade-Named Materials and Equipment
- 1.9 Submittal Register
- 1.10 Submittal Summary Sheets (ENG Form 4025)
- 1.11 Approvals or Disapproval
 - 1.11.1 Satisfactory Submittals
 - 1.11.2 Unsatisfactory Submittals
 - 1.11.3 Drawing Dimensions and Format
 - 1.11.4 Government Review Period
- 1.12 Final Approved Versions of Contractor Prepared Drawings
- 1.13 Submittal of Operation and Maintenance (O&M) Manuals and Parts Catalogs
 - 1.13.1 General
 - 1.13.2 Number of Copies
 - 1.13.3 Form of Submittal
 - 1.13.4 Operation Data
 - 1.13.5 Maintenance Data

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-- End of Section Table of Contents --

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUBMITTAL IDENTIFICATION

1.1.1 Submittal Descriptions (SD)

Submittals required are identified by SD numbers and titles as follows:

- SD-01 Preconstruction Submittals
- SD-02 Shop Drawings
- SD-03 Product Data
- SD-05 Design Data
- SD-06 Test Reports
- SD-07 Certificates
- SD-10 Operation and Maintenance Data
- SD-11 Closeout Submittals

1.1.2 Action Elements for Submittal Approval

AE	Architect/Engineer
C	Contractor
CD	Construction Division
EA	Engineering Division, Architectural Design
EC	Engineering Division, Soils-Civil Design
ECC	Environmental Compliance Coordinator
EE	Engineering Division, Electrical Design
EG	Engineering Division, Geotechnical
EH	Engineering Division, Hydraulic Design
EM	Engineering Division, Mechanical Design
ES	Engineering Division, Structural Design
HDC	Hydroelectric Design Center
EP	Engineering Division, Specifications
PMP	Project Management Planning Division
PEC	Planning Division Environmental Compliance
SO	Safety Office

1.2 Submittals

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with This Section:

- SD-01 Preconstruction Submittals

Submittal Register; G CD

SD-10 Operation and Maintenance Data

Operation and Maintenance (O&M) Manuals and Parts Catalogs; G CD

SD-11 Closeout Submittals

Final Approved Versions of Contractor Prepared Drawings; G CD

1.3 Submittal of Shop Drawings

Submittal of shop drawings as may be required by applicable requirements of the CONTRACT CLAUSES, the various sections of the TECHNICAL SPECIFICATIONS, and as indicated on the contract drawings shall be in accordance with the following additional requirements.

1.4 Quantity of Shop Drawings

Quantity of shop drawings to be submitted, as stated in CLAUSE: SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION of the CONTRACT CLAUSES, shall be six copies in lieu of the four copies specified. Five of the six copies submitted will be retained by the Contracting Officer.

1.5 Shop Drawings

A shop drawing is a Contractor's or manufacturer's drawing, brochure, sample, certificate, calculation, warranty, or other submittal which provides detail for construction and quality control of permanent work.

1.5.1 Approval of Shop Drawings

All shop drawings shall be Contractor approved; however, certain specified submittals will also require Contracting Officer approval. Approval by the Contracting Officer is required when submittals: (1) are specially identified in the various sections of the TECHNICAL SPECIFICATIONS for Contracting Officer approval, or; (2) are extensions of design, or; (3) depict deviation from the contract (e.g. an "or equal" decision, etc.), or; (4) involve equipment compatibility to provide operational system. All other submittals are for Contracting Officer information purposes only.

1.5.2 Shop Drawings Approved by Contractor

Contractor shall review and correct all drawings to make them complete and in accordance with the contract. Approval by Contractor shall be indicated on each drawing by an "Approved" stamp with Contractor's name, signature, and date. Names and titles of individuals authorized by Contractor to approve drawings shall be provided prior to any submission. All shop drawings shall be submitted. Submittals which are for information only do not require Contracting Officer approval but will be monitored and spot checks will be made. When such checks indicate noncompliance, the Contractor will be notified by the same method used for Contracting Officer approvals.

1.5.3 Shop Drawings Approved by Contracting Officer

Before submission, the Contractor shall review all shop drawings prepared by subcontractors, suppliers, and himself, for completeness and compliance

with plans and specifications, and shall certify completeness and compliance with an approval stamp on each drawing or item of printed material. Red markings are reserved for Contracting Officer. Suppliers' or subcontractors' certifications are not acceptable as meeting this requirement. Submittals which meet these requirements will be reviewed and processed as specified in paragraph: Approvals or Disapproval.

1.6 General Submittal Requirements

1.6.1 Required Submittals

The Contractor shall submit all items listed on the Submittal Register. In addition to the listed submittals the Contracting Officer may request submittals for items in the specifications or items shown on the drawings when deemed necessary to adequately describe the work covered in the specifications and drawings.

1.6.2 Submittals

1.6.2.1 Submittal of Shop Drawings

Submittals of shop drawings, shall be complete in detail; shall indicate materials, fastenings, design criteria, stress computations, design calculations, test curves, and wiring diagrams; shall indicate, when applicable, dimensions, thicknesses, types, grade, class, gage, and working and test pressures; shall indicate construction details, reinforcement and anchorage, and methods of installation and erection with relation to appurtenant construction; and shall include all required detailed information necessary to indicate full compliance with the plans and specifications. Shop drawings shall be supported by sufficient descriptive literature such as certified laboratory test reports, laboratory test labels, catalogs, cuts, diagrams, and other data published by the manufacturer to demonstrate conformance with the contract drawings and specifications. Manufacturer's designations and model numbers alone will not be acceptable unless same as the designation or model number referenced in the plans and specifications.

1.6.2.2 Sequence of Submission

The sequence of submission of drawings shall be such that all information is available for checking each drawing when it is received. Contract number and project shall be shown directly above the revision space on all drawings submitted. Drawing details and notes shall be of such quality and clarity and of sufficient definition and line weight as to permit sharp and totally legible microfilming. All items shall be adequately identified to show where they will be used, and shall be referenced to applicable contract drawings and specification section.

1.6.2.3 Single Transmittal

All shop drawings submitted on a single transmittal (ENG form 4025) shall pertain to only one specification section. Computed weights of all items shall be indicated on the shop drawings. Where drawings are submitted for either (1) assemblies consisting of more than one piece of equipment, or (2) systems consisting of numerous components dependent one on the other for matching or compatible characteristics, complete information shall be submitted on all such related components at the same time.

1.6.2.4 Succeeding Submittals

All revisions on a drawing, after the original submittal, shall be shown by number, date, and subject in the revision block. Shop drawings for all items and equipment which are of special manufacture or fabrication shall consist of complete assembly and detail drawings. Shop drawing requirements apply whether or not the items or equipment are detailed on the contract drawings, or when revisions to such details are made or are specified in other sections of the TECHNICAL SPECIFICATIONS.

1.6.3 Drawing Dimensions

All shop drawings prepared by the Contractor for this contract shall conform dimensionally to Drawing No. WWD-40-33-01 (attached at the end of this Section).

1.6.4 Initial Submittals

Two copies of the number of shop drawings to be included in the original shop drawing submittal specified in paragraph: Quantity of shop drawings, above, and two copies of ENG Form 4025 shall be sent to: USAED North West Division, Hydroelectric Design Center, CENWP-HDC-P, P.O. Box 2946, Portland, OR 97208-2946 (street address 333 S. W. First Ave, Portland, OR 97204). Four copies of shop drawings along with four copies of ENG Form 4025 shall be sent to: District Commander, ATTN: CENWW-CD, Walla Walla District Corps of Engineers, 201 North Third Avenue, Walla Walla, WA 99362-9265.

1.7 Standard Manufactured Items

Shop drawings for all standard catalog items and equipment manufactured on a repetitive basis shall include complete outline and installation data. The contract number and applicable bid item number shall be noted on each sheet. When more than one size, rating, or type appears on the catalog sheet, each item to be used shall be clearly identified by marking the applicable data with a heavy black arrow at each side. Descriptive data and optional features not applicable to items being supplied shall be marked out. When more than one catalog item makes up a bid item, all catalog sheets making up the bid item shall be compiled as a set. Each set shall have a cover sheet upon which will be shown the contract number, project name, bid item number, and nomenclature.

1.8 Trade-Named Materials and Equipment

If items called for in these specifications or on the contract drawings are identified by trade name or equal description, such identification is intended to be descriptive, but not restrictive, and indicates the quality and characteristics of products that will meet contract requirements. Equal products proposed for use will be considered for approval if such products are clearly identified in submittals and are determined by the Government to be equal in all material respects to the trade-name products referenced on the drawings or in the specifications. Determination as to equality of the product offered is the responsibility of the Government and will be based on information furnished by the Contractor in his submittal, as well as other information readily available to the Contracting Officer. Accordingly, to insure that sufficient information is available, the Contractor shall furnish as part of his submittal all descriptive material (such as cuts, illustrations, drawings, or other information) necessary for the Contracting Officer to (1) determine whether the product submitted

meets the requirements of the contract documents, and (2) establishes exactly what the Contractor proposes to furnish and what the Government would be binding itself to accept by approving such product. The information furnished may include specific references to information previously furnished or to information otherwise available to the Contracting Officer. If the Contractor proposes to modify a product so as to make it conform to the requirements of the contract, he shall (1) include in his submittal a clear description of such proposed modifications and (2) clearly mark any descriptive material to show the proposed modifications.

1.9 Submittal Register

At the end of this section is the Submittal Register which is a listing of each item of equipment and material for which submittals are required by the specifications. Columns "c" thru "f" have been completed by the Government. The Contractor shall complete columns "a", "b", and "g" thru "k" and return two completed copies to the Contracting Officer for approval within 30 calendar days after Notice to Proceed. In preparing the document, adequate time (minimum of 30 days) shall be allowed for review and approval and possible resubmittal. The CQC representative shall review the listing on the schedule at least every 30 days and take appropriate action to maintain an effective scheduling system. Three copies of updated or corrected listings shall be submitted to the Contracting Officer at least every 30 days. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. This register and the progress schedules shall be coordinated.

1.10 Submittal Summary Sheets (ENG Form 4025)

This form is used to transmit all submittals listed on the Submittal Register or otherwise required by this contract. This form will be made available to the Contractor by the Government. Each transmittal shall contain the following information:

- (1) Project title, contract number, and Contractor's name.
- (2) Subcontractor, supplier, or manufacturer's name, as applicable.
- (3) Applicable specification paragraph number or numbers.
- (4) Contract drawing numbers and sheet numbers.
- (5) Transmittal number. Transmittals shall be numbered in continuously ascending order by specification section. For example, the first transmittal from specification 15650 would be numbered 15650-1. The second transmittal would be 15650-2, etc. Any resubmittal, either required by previous rejection or for Contractor convenience shall be numbered with the original number plus a digit in the decimal place. For example, the first resubmittal of 15650-1 would be 15650-1.1 and the second resubmittal would be 15650-1.2.
- (6) Items submitted for approval.

The Contractor shall certify, with each submittal of shop drawing lists, that he has reviewed the submittal, etc., in detail and that they are correct and in strict conformance with the requirements of the contract drawings and specifications, except as may be otherwise explicitly stated.

The certificate may be simply a signed statement by the Contractor attesting to the above requirements. Suppliers' or subcontractors' certificates are not acceptable as meeting this requirement; however, they may be attached to the Contractor's certificate to complete the submittal. The Contractor shall also certify, with each information copy of each Contractor approved submittal, as to the correctness and compliance of the submittal as specified above.

1.11 Approvals or Disapproval

1.11.1 Satisfactory Submittals

If the shop drawings and/or submittal documents as submitted are complete and the contents satisfy contract requirements, one paper copy or one copy of catalog data will be returned stamped "APPROVED." Such approval shall not be construed as authorizing any deviation from the plans and specifications, unless these deviations are brought to the attention of the Contracting Officer in the letter or summary sheet which transmits the shop drawings for approval and are also shown on the shop drawings. Deviations brought to the attention of the Contracting Officer or noted by the Government during review of shop drawings, and in either instance approved for use, shall be performed at no additional cost to the Government. If corrections are necessary, but in the opinion of the Contracting Officer are of a minor nature, the Government will revise and return one copy stamped, "APPROVED AS CORRECTED." If the Contractor objects to the revisions, he shall resubmit the submittal, including alternative revisions. He shall set forth his objections in accompanying correspondence. If a modification to the contract is being prepared by the Government, submittals so affected will be marked, "Approval withheld due to forthcoming change order."

1.11.2 Unsatisfactory Submittals

If the submittals are incomplete or contents plus available supplemental information do not illustrate compliance with contract requirements, they will be appropriately marked showing items of noncompliance and one print will be returned stamped "RETURNED FOR CORRECTION" with reasons therefore if otherwise not obvious. The Contractor shall make any corrections required by the Contracting Officer, and shall resubmit the documents and data including the same number of prints as required for approval in the same manner as before. Every revision shall be shown by number, date, and subject in a revision block. If revisions are made by the Contractor after a drawing has been approved, the Contractor shall again resubmit for approval as noted above. The time consumed in preparing, submitting, and obtaining approval of submittals shall be included in the time allowed for completion of the contract.

1.11.3 Drawing Dimensions and Format

Shop drawings submitted under this section of the specifications which do not conform to the requirements as to size and format will be returned without action.

1.11.4 Government Review Period

The Contractor shall allow the Government 30 days to review submittals and for each resubmittal. The 30-day period shall commence at date of receipt of transmittals from the Contractor by the Government and the period shall end at date of signature of Approving Authority on ENG Form 4025.

1.12 Final Approved Versions of Contractor Prepared Drawings

Upon completion of the work under this contract, the Contractor shall submit for review and approval by the Contracting Officer, hard copies (black and white prints) of the final approved versions of the drawings. All paper drawings submitted to the Contracting Officer shall comply with the size indicated on Drawing No. WWD-40-33-01 attached at the end of this section. The drawings shall show all changes and revisions, including any field changes, made up to the time that the work is completed and accepted.

The Contractor shall also prepare an index drawing for all Contractor prepared drawings. The index drawing shall include the sheet number, file number, drawing title, and the CADD file name for each drawing. After approval of these drawings, the Contractor shall furnish a complete set of electronic files in Bentley (Intergraph) MicroStation Version 05.07, or latest version, for all drawings produced by the Contractor in performance of this contract, except that submittal of concrete placement drawings, concrete reinforcement drawings, and concrete formwork drawings is not required. Electronic files shall be .dgn format with element types that can be edited (i.e. no attached raster files, .dxf, or .dwg file formats will be accepted). Each drawing sheet shall be a separate CAD file. The files shall be submitted on CD ROM's. In addition, the Contractor shall furnish one paper copy of every drawing that is on the CD ROM's. The paper drawings and the files on the CD ROMS shall be identical.

1.13 Submittal of Operation and Maintenance (O&M) Manuals and Parts Catalogs

1.13.1 General

Operation and maintenance instructions and parts catalogs which are required for operation, maintenance, dismantling, and/or assembling of equipment furnished by the Contractor, or for identification of parts for procurement of replacements, shall be prepared covering the equipment required to be included in the O&M manuals as required in the technical specifications. Data submitted for the operation and maintenance manuals is in addition to that furnished for the submittal of shop drawings.

1.13.2 Number of Copies

Four draft copies shall be submitted for approval at least 15 days prior to delivery or at least 60 days prior to scheduled installation, whichever is earlier. The Contracting Officer will return two draft copies of the data either "APPROVED," or "RETURNED FOR CORRECTION." The Contractor shall resubmit corrected and additional data as directed by the Contracting Officer. Upon final approval of all draft submissions of all O&M requirements, the Contractor shall submit three final copies for approval. If the final O&M manuals are "Returned for Correction," two of the three sets of manuals will be returned to the Contractor with all submitted final binders. If final O&M manuals are "Approved," the Government will retain all three copies and return a signed ENG Form 4025 to the Contractor.

1.13.3 Form of Submittal

The final O&M submission shall be an assembly of all draft copies and other data required. The submittal shall consist of as many binders as required with a maximum thickness per binder of 3 inches. The binders shall have a durable stiff plastic or leatherette cover and shall be designed for 8-1/2-by 11-inch sheets with binding either of telescoping posts and slide-lock or with fastening using screw posts. Either type of binding provided shall

be suitable for ready replacement of sheets. Ring-type loose-leaf binders will not be acceptable. Covers of binders shall bear permanent printed markings listing the following:

- (1) Name of project.
- (2) Contract number.
- (3) Name and address of Contractor.
- (4) Specific item or materials covered by the manual.
- (5) Date of submittal.

One source of acceptable binders is: Arts & Crafts Book Manufacturing
E 618 Second Avenue
Spokane, Washington 99202
telephone: (509) 747-3818

Shop drawings, assembly drawings, wiring diagrams and/or schematics utilizing previously approved shop drawings or specially prepared drawings for these manuals or parts catalogs shall be of a size that requires folding only in left-to-right coordinate as a manual or catalog is opened. Each sheet in the binder shall be numbered and an index provided for ready reference to the data. Each manual shall contain a master table of contents. The master table of contents shall contain all chapters, appendixes, and a master index and shall be included in the front of the first volume if there is more than one volume. Each subsequent volume shall contain an index for the contents within that respective volume. Each volume shall not be broken between chapters, appendixes, and indexes. All chapters, appendixes, and indexes shall be adequately separated and identified by standard line indexes. All standard catalog cuts, manufacturer's printed data or descriptive literature, parts sheets, illustrations, etc., shall either be original manufacturer sheets or reproduced copies equal in clarity and durability to the original copies. At least one copy of such manuals or parts catalogs shall contain all original copies of such data. Thermofax and similar nonpermanent copies are not acceptable.

1.13.4 Operation Data

Operation data to be furnished shall include (as applicable but not limited to) the following:

- (1) Specific detailed operating instructions.
- (2) Recommended or required operation sequence(s).
- (3) Functional description of operating parts.
- (4) Special precautions or operating procedures.

The Contractor shall be responsible for the necessary coordination of all components between his subcontractors, suppliers, and manufacturers to assure complete submittals on individual interrelated equipment components. Overall general operating instructions shall be included for all systems.

1.13.5 Maintenance Data

Maintenance data to be furnished shall include (as applicable but not limited to) the following:

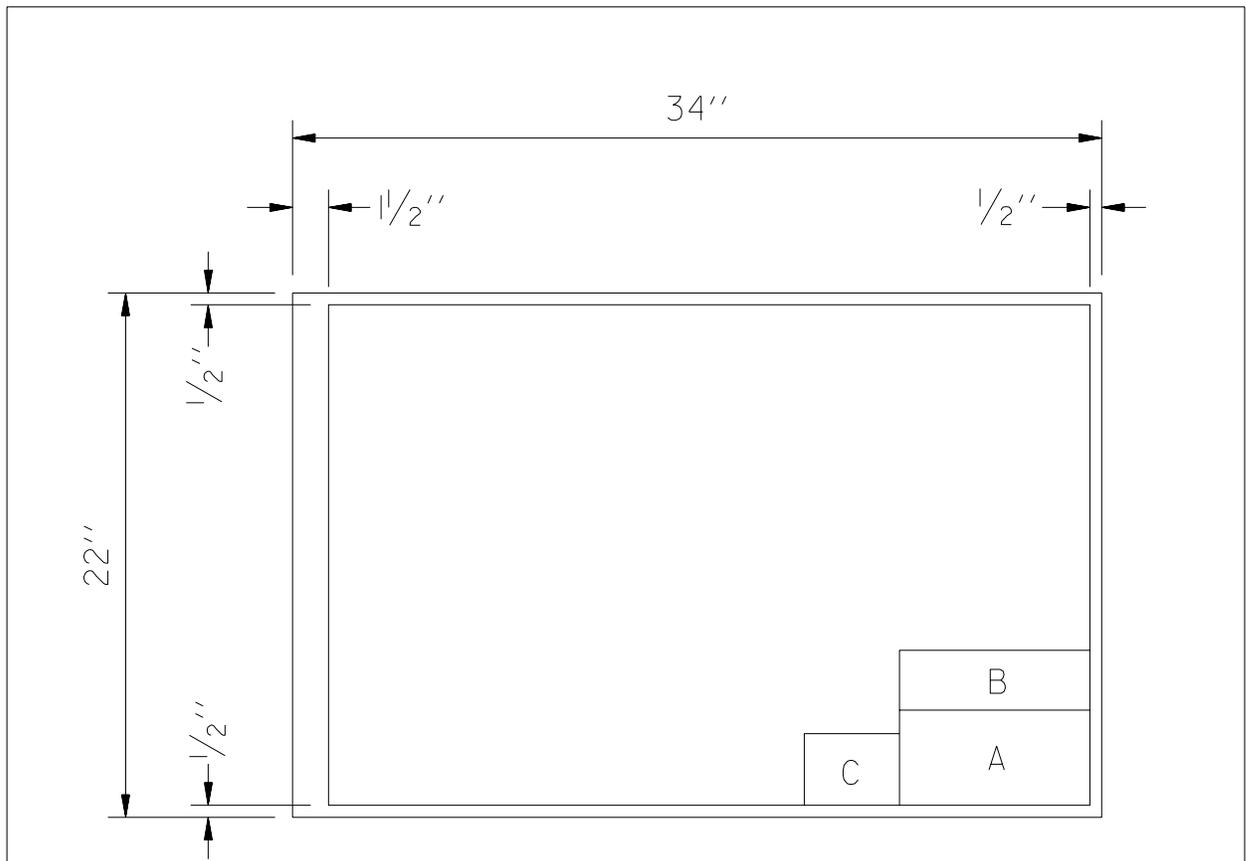
- (1) Lubrication instructions.
- (2) Instructions for dismantling, assembly, repair and adjustment.
- (3) Parts catalogs.
- (4) Elementary and detailed electrical connection diagrams.
- (5) Hydraulic circuit diagrams with recommended or required control and relief valve settings.
- (6) Control and interlock system diagrams.
- (7) A list of any special tools required for maintenance or repairs.
- (8) Name and address of suppliers of parts.

Lubrication instructions shall be for the service intended and shall include charts or tables indicating items to be lubricated, recommended frequencies, and grade and type of lubricant to be used in accordance with AGMA, NLGI, SAE, Federal or Military Specifications, as applicable. Where the Contractor or the supplier has installed a lubricant or oil prior to shipment to the project, the "Brand Name" as well as the specification shall be indicated. Instructions for dismantling, assembly, repair and adjustment shall include recommended clearances, bolt torques, pressure settings, etc. Parts catalogs shall include the identification, nomenclature, part numbers, required number of parts, recommended list of spare parts to be stocked at the project, and actual spare parts supplied under this contract. All data shall match the actual equipment furnished, and standard catalog sheets, cuts, and diagrams will not be acceptable unless all irrelevant parts are marked out and relevant parts are identified by heavy arrows or equal suitable marking at each side of the applicable data.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-- End of Section --



LEGEND

- A - TITLE BLOCK - 4"X8"
 - B - REVISION BLOCK - 2 1/2"X8"
 - C - BLANK SPACE - 3"X4"
- (FOR CONTRACTING OFFICER'S USE)

U. S. ARMY ENGINEER DISTRICT
 WALLA WALLA
 CONTRACTOR
 SHOP DRAWINGS
 WWD-40-33-01

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE <i>(Read instructions on the reverse side prior to initiating this form)</i>	DATE	TRANSMITTAL NO.
---	------	-----------------

SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS *(This section will be initiated by the contractor)*

TO:	FROM:	CONTRACT NO.	CHECK ONE: <input type="checkbox"/> THIS IS A NEW TRANSMITTAL <input type="checkbox"/> THIS IS A RESUBMITTAL OF TRANSMITTAL _____
-----	-------	--------------	---

SPECIFICATION SEC. NO. <i>(Cover only one section with each transmittal)</i>	PROJECT TITLE AND LOCATION	CHECK ONE: THIS TRANSMITTAL IS FOR <input type="checkbox"/> FIO <input type="checkbox"/> GOV'T. APPROVAL
--	----------------------------	---

ITEM NO.	DESCRIPTION OF ITEM SUBMITTED <i>(Type size, model number/etc.)</i>	MFG OR CONTR. CAT., CURVE DRAWING OR BROCHURE NO. <i>(See instruction no. 8)</i>	NO. OF COPIES	CONTRACT REFERENCE DOCUMENT		FOR CONTRACTOR USE CODE	VARIATION <i>(See instruction No. 6)</i>	FOR CE USE CODE
				SPEC. PARA. NO.	DRAWING SHEET NO.			
a.	b.	c.	d.	e.	f.	g.	h.	i.

REMARKS	I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as other wise stated. _____ NAME AND SIGNATURE OF CONTRACTOR
---------	---

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED <i>(List by Item No.)</i>	NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY	DATE
---	--	------

INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.
2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the Contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new submittal number.
3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288-R for each entry on this form.
4. Submittals requiring expeditious handling will be submitted on a separate form.
5. Separate transmittal form will be used for submittals under separate sections of the specifications.
6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications – also, a written statement to that effect shall be included in the space provided for "Remarks".
7. Form is self-transmittal, letter of transmittal is not required.
8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.
9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the Contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

A	--	Approved as submitted.	E	--	Disapproved (See Attached)
B	--	Approved, except as noted on drawings.	F	--	Receipt acknowledged.
C	--	Approved, except as noted on drawings. Refer to attached sheet resubmission required.	FX	--	Receipt acknowledged, does not comply as noted with contract requirements.
D	--	Will be returned by separate correspondence.	G	--	Other (<i>Specify</i>).

10. Approval of items does not relieve the Contractor from complying with all the requirements of the Contract plans and specifications.

(Reverse of ENG FORM 4025-R)

SUBMITTAL REGISTER

CONTRACT NO.
W912EF-04-B-0006

TITLE AND LOCATION Ice Harbor PH Bridge Crane Rehab						CONTRACTOR											
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEW	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY					MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01010	SD-01 Preconstruction Submittals														
			Accident Prevention Plan	1.9.2	G CD												
			Equipment List	1.4													
			Safe Clearance (Lockout) Procedures	1.10	G CD												
			Contractor's Schedule	1.12.1													
			SD-11 Closeout Submittals														
			As-Built Contract Drawings	1.23	G CD												
		01320	SD-01 Preconstruction Submittals														
			Initial Project Schedule	3.4.1	G CD												
			Periodic Schedule Updates	3.4.2	G CD												
		01330	SD-01 Preconstruction Submittals														
			Submittal Register	1.9	G CD												
			SD-10 Operation and Maintenance Data														
			Operation and Maintenance (O&M) Manuals and Parts Catalogs	1.13	G CD												
			SD-11 Closeout Submittals														
			Final Approved Versions of Contractor Prepared Drawings	1.12	G CD												
		01355	SD-01 Preconstruction Submittals														
			Environment protection plan	1.6.1	G ECC												
			HAZARDOUS WASTE HANDLING PLAN	1.14	G ECC												
		01451	SD-01 Preconstruction Submittals														

SUBMITTAL REGISTER

CONTRACT NO.
W912EF-04-B-0006

TITLE AND LOCATION						CONTRACTOR											
Ice Harbor PH Bridge Crane Rehab																	
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEW	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01451	Contractor Quality Control Plan	3.2.1	G CD												
		02080	SD-01 Preconstruction Submittals														
			Asbestos Plan	1.3.1	G HDC												
			SD-03 Product Data														
			Encapsulants	2.1.5	G HDC												
			Respirators	1.8.1	G HDC												
			SD-06 Test Reports														
			Bulk Sampling Results	3.2													
			Respirator Fit Test Results	1.3.3													
			Air Monitoring Personnel	1.13	G HDC												
			SD-07 Certificates														
			Testing Laboratory	1.13	G HDC												
			Industrial Hygienist	1.12	G HDC												
			Training	1.3.2													
			Medical Examination	1.9													
			Permits and Notification	1.11													
			Waste Disposal Site (WDS)	1.3.7													
			Insurance	1.10													
			Previous Citations	1.3.4													
			Work Site Entry Logbook	1.6.2													
			Daily Narrative Log	1.14													
			Pressure Differential Recordings	1.3.5													
			Air Monitoring Results	1.3.6													
			Waste Shipment Record (WSR)	3.9													
		05101	SD-02 Shop Drawings														
			Bridge Crane	1.4	G HDC												

SUBMITTAL REGISTER

CONTRACT NO.
W912EF-04-B-0006

TITLE AND LOCATION						CONTRACTOR											
Ice Harbor PH Bridge Crane Rehab																	
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION / REVIEWER	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		05101	SD-05 Design Data														
			Welding Procedures	3.2.4.1	G HDC												
			Qualification of Welders and Welding Operators	3.2.3	G HDC												
			Inspection Agency Qualifications	3.3.2.3	G HDC												
			Welding repair plan	3.3.2.6	G HDC												
		05502	SD-02 Shop Drawings														
			Operator's cab	2.2	G HDC												
			SD-03 Product Data														
			Materials	2.1	G HDC												
			SD-06 Test Reports														
			Materials	2.1													
			SD-11 Closeout Submittals														
			Disposition Records	1.4													
		09900	SD-01 Preconstruction Submittals														
			Batch Sampling	1.11.1													
			Qualifications	1.6	G HDC												
			Airborne Sampling Results	1.3.1	G HDC												
			Ventilation Assessment	1.7.6.1	G HDC												
			Containment Plan	1.5	G HDC												
			Water Quality Plan	1.5	G HDC												
			SD-06 Test Reports														
			System No. 16	2.1													
		14630	SD-02 Shop Drawings														
			Detailed shop drawings	1.1	G HDC												
			SD-03 Product Data														

SUBMITTAL REGISTER

CONTRACT NO.
W912EF-04-B-0006

TITLE AND LOCATION Ice Harbor PH Bridge Crane Rehab						CONTRACTOR											
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER			ACTION CODE
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		14630	Crane inspectors, craftsmen, and crane operators	3.1.1	G HDC												
			Rehabilitation Procedure	3.2	G HDC												
			Pre-Rehabilitation Inspection Procedure	3.4	G HDC												
			Post-Rehabilitation Inspection Procedure	3.6.1	G HDC												
			Preliminary No-Load Test Results	3.7.1	G HDC												
			Acceptance Test Procedure	3.7.1	G HDC												
			Test Weight Handling Procedures	3.7.2	G HDC												
			Detailed Drawings of Test Weight Configuration	3.7.2	G HDC												
			Crane Rerating Computations	1.3.1	G HDC												
		15000	SD-02 Shop Drawings														
			Dimensioned Outline Drawings	1.4	G HDC												
			SD-03 Product Data														
			Data for Bridge Crane Components	1.5	G HDC												
			Computations	1.5.1	G HDC												
		16050	SD-02 Shop Drawings														
			Dimensioned Outline Drawings	1.4	G HDC												
			SD-03 Product Data														
			Motors	2.5	G HDC												
			Electric Holding Brakes	2.6	G HDC												
			Control Systems and Equipment	2.3	G HDC												
			Variable Frequency Drives	2.3.4	G HDC												

SUBMITTAL REGISTER

CONTRACT NO.
W912EF-04-B-0006

TITLE AND LOCATION Ice Harbor PH Bridge Crane Rehab						CONTRACTOR											
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		16050	Master Switches	2.3.7	G HDC												
			Limit Switches	2.3.8	G HDC												
			Load Cells	2.3.9	G HDC												
			Lighting System	2.7	G HDC												
			Conduit	2.8	G HDC												
			Conduit	3.2.3	G HDC												
			Wire and Cable	2.9	G HDC												
			Conductors	2.1.2	G HDC												
			Collectors	2.1.2	G HDC												
			SD-06 Test Reports														
			Electric Holding Brakes Tests	3.3.2	G HDC												
			Control System Equipment Tests	3.3.3	G HDC												
			Wiring Tests	3.3.5	G HDC												
			SD-07 Certificates														
			Torque rating	2.6.3													

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01355

ENVIRONMENT PROTECTION

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 GENERAL
- 1.3 SUBMITTALS
- 1.4 NOTIFICATION
- 1.5 SUBCONTRACTORS
- 1.6 IMPLEMENTATION
 - 1.6.1 Environment Protection Plan
 - 1.6.2 Environmental Compliance Meeting
- 1.7 PROTECTION OF LAND RESOURCES
 - 1.7.1 General
 - 1.7.2 Equipment
 - 1.7.3 Prevention of Spillage's
 - 1.7.4 Landscape Restoration.
- 1.8 PROTECTION OF WATER RESOURCES.
 - 1.8.1 General
 - 1.8.2 Prevention of Spillage's
- 1.9 SPILL PROTECTION
- 1.10 PROTECTION OF FISH AND WILDLIFE
- 1.11 PRESERVATION AND RECOVERY OF HISTORICAL, ARCHAEOLOGICAL AND CULTURAL RESOURCES
- 1.12 MATERIALS
 - 1.12.1 Material Safety Data Sheets
- 1.13 CONTROL AND DISPOSAL OF WASTES.
 - 1.13.1 Hazardous Waste Disposal
 - 1.13.1.1 Hazardous Waste Disposed of by the Contractor
 - 1.13.1.2 Hazardous Waste Disposed of by the Government
 - 1.13.2 Waste Minimization
 - 1.13.3 Hazardous Waste Storage
 - 1.13.4 Other Regulatory Requirements
 - 1.13.4.1 Manifesting, Transporting And Disposal Of Hazwaste
- 1.14 HAZARDOUS WASTE HANDLING PLAN
- 1.15 BURNING
- 1.16 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION
- 1.17 CONTRACTOR QUALITY CONTROL

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-- End of Section Table of Contents --

SECTION 01355

ENVIRONMENT PROTECTION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1910.1200	Hazard Communication
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Generators of Hazardous Waste
40 CFR 263	Transporters of Hazardous Waste
40 CFR 264	Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standard for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
49 CFR 172.205	Hazardous Waste Manifest
49 CFR 178	Shipping Container Specification

WASHINGTON STATE ADMINISTRATIVE CODE (WAC)

WAC 173-303-630	Use and Management of Containers
-----------------	----------------------------------

CORPS OF ENGINEERS (COE)

COE EM-385-1-1	(2003) Safety and Health Requirements Manual
----------------	--

1.2 GENERAL

The work covered by this section consists of furnishing all labor, materials and equipment and performing all work required for the protection of the environment during construction operations except for those measures set forth in other sections of the TECHNICAL SPECIFICATIONS. For the

purpose of this specification, environment protection is defined as the retention of the environment in its natural state to the greatest possible extent during project operations and to enhance the natural appearance in its final condition. Environment protection requires consideration of air, water, and land, and involves noise, solid-waste management and management of radiant energy and radioactive materials, as well as other pollutants. In order to prevent, and to provide for abatement and control of, any environmental pollution arising from the construction activities, the Contractor and his subcontractors in the performance of this contract, shall comply with all applicable Federal, State, and local laws, and regulations concerning environmental pollution control and abatement.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Environment protection plan; G,ECC

HAZARDOUS WASTE HANDLING PLAN; G,ECC

1.4 NOTIFICATION

The Contractor shall notify the Contracting Officer in writing, within three days, of any noncompliance with the aforementioned Federal, State, or local laws or regulations. In the event of a spill or release of pollutants the Contractor shall notify the Contracting Officer immediately.

The Contractor shall, after delivery of such notice, immediately inform the Contracting Officer of proposed corrective action and take such action.

If the Contractor fails or refuses to act promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor.

1.5 SUBCONTRACTORS

Compliance with the provisions of this section by subcontractors will be the responsibility of the Contractor.

1.6 IMPLEMENTATION

1.6.1 Environment Protection Plan

Prior to commencement of the work the Contractor shall submit in writing his proposals for implementing this section for environment protection.

1.6.2 Environmental Compliance Meeting

Prior to commencement of the work the Contractor shall meet with representatives of the Contracting Officer and the facility's Environmental Compliance Coordinator (ECC) to develop mutual understandings relative to compliance with this provision and administration of the environment protection program. Approval of the Contractor's plan for environment

protection will not relieve the Contractor of his responsibility for adequate and continuing control of pollutants.

1.7 PROTECTION OF LAND RESOURCES

The land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction that will appear to be natural and not detract from the appearance of the project area. The Contractor shall confine his construction activities to areas defined by the plans or specifications or as approved.

1.7.1 General

The Contractor shall not pollute land surfaces with any substance defined as a solid, dangerous or hazardous waste or regulated substance by Federal, State, and local laws and regulations. Fueling and lubrication of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spills. If any waste material is spilled in unauthorized areas, the Contractor shall, within 24 hours, remove the material and restore the area to the condition that existed prior to spilling. If necessary, contaminated ground shall be excavated, disposed of as directed by the Contracting Officer, and replaced with suitable fill material, compacted and finished with topsoil and planted as required to re-establish vegetation.

1.7.2 Equipment

Construction equipment shall be kept in good repair, without leaks of fuel, hydraulic or lubricating fluids. If such leaks or drips do occur, they shall be cleaned up immediately. Drip pans shall be utilized when vehicles are parked. Confine equipment maintenance to one location. Equipment repairs shall be performed off the project site. Control runoff in this area to prevent contamination of soils and water.

1.7.3 Prevention of Spillage's

Special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, sewage, chlorinated solutions, herbicides and insecticides, and cement and concrete drainage from entering surface land and substrate soils.

1.7.4 Landscape Restoration.

At or before contract completion, obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and all other vestiges of construction. Temporary roads, parking areas, and similar temporary use areas shall be graded in conformance with surrounding areas.

1.8 PROTECTION OF WATER RESOURCES.

1.8.1 General

The Contractor shall not pollute surface water with any substance defined as a solid, dangerous or hazardous waste or regulated substance by Federal, State, and local laws and regulations. Fueling and lubrication of

equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spills. If any waste material is spilled in unauthorized areas, the Contractor shall immediately remove the material and restore the area to the condition that existed prior to the spill.

1.8.2 Prevention of Spillage's

Special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, sewage, chlorinated solutions, herbicides and insecticides, and cement and concrete drainage from entering surface and subsurface waters.

1.9 SPILL PROTECTION

Special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, and waste washings from entering public lands or waters. The Contractor shall provide and utilize the following prevention/cleanup materials:

- a. Fuel dispensing vehicles shall carry a Blue Ribbon Environmental (BRE) Tanker Fueling Berm or equal spill kit on board at all times.
- b. Overnight containment berm for all vehicles stored unattended overnight (BRE Port-A-Berm or equal).
- c. Emergency spill response kit to be available within 15 minutes transport time to equipment performing work (BRE-PZ-HMR-25G-H or equal).
- d. Emergency spill absorbent matts (10-18"x18") to be carried on board equipment performing work (BRE-PZ-MT-1818 or equal).
- e. All hydraulically operated equipment used for cutting, sawing, drilling, and coring concrete shall be equipped with biodegradable oil.

All containment berms must be capable of containing 110% of the hazardous materials without release. The Contractor shall promptly notify the Contracting Officer, or in the absence of the Contracting Officer the projects ECC, of any spills. The Contractor shall clean up and dispose of all spill materials.

1.10 PROTECTION OF FISH AND WILDLIFE

The Contractor shall at all times perform all work and take such steps required to minimize interference with or disturbance to fish and wildlife. The Contractor will not be permitted to alter water flows or otherwise disturb native habitat adjacent to the project areas without Contracting Officers approval.

1.11 PRESERVATION AND RECOVERY OF HISTORICAL, ARCHAEOLOGICAL AND CULTURAL RESOURCES

If during construction activities the Contractor observes items that might have historical or archaeological value, such observations shall be reported immediately to the Contracting Officer so that appropriate authorities may be notified and a determination may be made by the Contracting Officer as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all activities that may result in the destruction of these resources and shall prevent his employees from trespassing on, removing, or otherwise damaging

such resources.

1.12 MATERIALS

The Contractor shall make every effort to use environmentally safe (green) chemicals and substances. When that is not possible, the Contracting Officer and the ECC shall be advised of hazardous chemicals, compounds and agents (names, quantities used, special handling and storage requirements, etc.) prior to the use of the materials on site.

1.12.1 Material Safety Data Sheets

The Contractor shall provide Material Safety Data Sheets on all materials brought onto the work site as required in COE EM-385-1-1.

1.13 CONTROL AND DISPOSAL OF WASTES.

With the exception of materials specifically indicated or specified to be salvaged for reuse in construction, or turned over to the Government, all wastes and demolished materials shall become the property of the Contractor and shall be removed from the job site daily. The Contractor shall furnish and empty waste containers daily, in accordance with Federal, State, and local regulations.

1.13.1 Hazardous Waste Disposal

Any hazardous waste as defined at 40 CFR 261 generated from work performed on site under this contract (hereinafter "hazwaste") shall be disposed of by the Contractor or by the Government as described below.

1.13.1.1 Hazardous Waste Disposed of by the Contractor

All Contractor generated hazardous waste from the operation of Contractor-owned or -operated equipment, or generated as a result of the Contractor's work methods or hazardous materials used in this contract are the sole responsibility of the Contractor to manage and dispose of in compliance with all Federal, State, and local regulatory requirements. The Contractor shall not mix Contractor generated hazardous waste with any waste that will be disposed of by the Government.

1.13.1.2 Hazardous Waste Disposed of by the Government

The Government will dispose of hazardous waste generated by work under this contract such as lead based paint and asbestos materials. The Contractor shall remain responsible for the identification, segregation, containerization, and labeling and dating of all hazardous waste generated by work under this contract.

1.13.2 Waste Minimization

The Contractor shall make every effort to minimize the amount of hazardous waste generated through measures such as using alternative non-hazardous materials, recycling, etc. Where the use of hazardous materials is necessary, the Contractor shall take steps to use the minimum amount required to complete the task. Wastes generated from these activities shall be carefully segregated so as to not commingle wastes that require different treatment methods.

1.13.3 Hazardous Waste Storage

Hazwaste shall be stored in corrosion resistant containers with matching lids and labeled in accordance with the requirements of 49 CFR 178. All containers, including removable head steel drums (DOT 1A2) shall be in new condition. Once full, or when no more waste will be put into the container, the Contractor shall move the container(s) to the facility's temporary hazardous waste storage facility. The Contractor shall notify the facility ECC at least 24 hours in advance of moving hazwaste containers to the storage site. The Contractor is responsible for ensuring that all tasks are completed in order that the hazwaste can be properly characterized, designated, packaged, and labeled.

1.13.4 Other Regulatory Requirements

1.13.4.1 Manifesting, Transporting And Disposal Of Hazwaste

- a. Manifesting, transporting and disposal of hazwaste shall comply with the applicable provisions of 40 CFR 262, 40 CFR 263, 40 CFR 264 and 49 CFR 172.205. General safety and health requirements for hazwaste workers are as outlined in 29 CFR 1910.
- b. Removal and disposal of PCB containing articles shall comply with the provisions of 40 CFR 761 and shall be coordinated with and approved by the facility ECC.
- c. The disposal of non-hazardous petroleum products or petroleum contaminated soil and water shall be in accordance with procedures meeting Federal, State and local regulations and shall be coordinated with and approved by the facility ECC.

1.14 HAZARDOUS WASTE HANDLING PLAN

The Contractor is required to comply with all Federal, State, and local laws and regulations when handling hazardous materials and disposing of and handling hazardous and other wastes. The Contractor shall prepare and submit a compliance plan detailing how the Contractor handles and disposes of hazardous materials, petroleum products, hazardous substances, and hazardous waste. The plan shall include, but is not limited to, the following elements as appropriate:

- (a) General storage site plan.
- (b) An inventory of all hazardous chemicals, compounds, and other agents brought onto the project site accompanied by their respective Material Safety Data Sheets. The Contractor and the Government will jointly maintain the Material Safety Data Sheets for all hazardous materials in accordance with 29 CFR 1910.1200.
- (c) A list of all anticipated hazardous wastes to be generated and a Federal, State, and local regulation cross reference list for those wastes.
- (d) Waste collection and containment procedures shall be in accordance with Subpart I of 40 CFR 265, and WAC 173-303-630.
- (e) A hazardous materials spill and cleanup plan including tools and materials that will be on hand and readily available to facilitate containment and cleanup.

(f) Training certification for Contractor's hazardous waste manager.

1.15 BURNING

Burning will not be permitted.

1.16 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

During the life of this contract the Contractor shall maintain all facilities constructed for pollution control under this contract as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

1.17 CONTRACTOR QUALITY CONTROL

The Contractor shall establish and maintain quality control for environmental protection of all items set forth herein. The Contractor shall record on daily reports any problems in complying with laws, regulations and ordinances and corrective action taken.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01451

CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

- 1.1 REFERENCES.
- 1.2 PAYMENT
- 1.3 SUBMITTALS

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

- 3.1 GENERAL
- 3.2 CONTRACTOR QUALITY CONTROL (CQC) PLAN
 - 3.2.1 General
 - 3.2.2 Content of the CQC Plan
 - 3.2.3 Acceptance of Plan
 - 3.2.4 Notification of Changes
- 3.3 COORDINATION MEETING
- 3.4 QUALITY CONTROL ORGANIZATION
 - 3.4.1 CQC System Manager
 - 3.4.2 CQC Organizational Staffing
 - 3.4.3 Organizational Changes
 - 3.4.4 Additional Requirement
- 3.5 SUBMITTALS
- 3.6 CONTROL
 - 3.6.1 Preparatory Phase
 - 3.6.2 Initial Phase
 - 3.6.3 Follow-up Phase
 - 3.6.4 Additional Preparatory and Initial Phases
- 3.7 TESTS
- 3.8 COMPLETION INSPECTION
- 3.9 DOCUMENTATION
- 3.10 NOTIFICATION OF NONCOMPLIANCE
- 3.11 (Sample of Quality Control Report, WWD-QCR (Rev Sep 85) follows)

-- End of Section Table of Contents --

SECTION 01451

CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.1 REFERENCES.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740	(1996) Evaluation of Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(1998; Rev. A) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable unit prices or lump-sum prices contained in the Bidding Schedule.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor Quality Control Plan; G,CD

Submit the Contractor Quality Control (CQC) Plan.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the clause entitled INSPECTION OF CONSTRUCTION of the CONTRACT CLAUSES. The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all on-site construction operations and shall be keyed to the proposed construction sequence. The Contractor

shall utilize established in-house quality control procedures to assure full compliance with all off-site work. The Contractor shall submit daily reports in compliance with paragraph DOCUMENTATION for all on-site work and for all off-site work.

3.2 CONTRACTOR QUALITY CONTROL (CQC) PLAN

3.2.1 General

The Contractor shall furnish for review by the Government, not later than 5 days after receipt of notice to proceed, the Contractor Quality Control Plan proposed to implement the requirements of the clause entitled INSPECTION OF CONSTRUCTION of the CONTRACT CLAUSES. The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The Government will consider an interim plan for the first 15 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.2.2 Content of the CQC Plan

The CQC plan shall include, as a minimum, the following to cover all construction operations, both on-site and off-site, including work by subcontractors, fabricators, and suppliers:

- a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC system manager who shall report to the project manager or someone higher in the Contractor's organization. Project manager in this context shall mean the individual with responsibility for the overall management of the project including quality and production.
- b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a QC function.
- c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities and responsibilities. Copies of these letters shall also be furnished to the Government.
- d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, off-site fabricators, suppliers and purchasing agents. These procedures shall be in accordance with Section 01330: SUBMITTAL PROCEDURES.
- e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and

person responsible for each test. (Laboratory facilities will be subject to approval by the Contracting Officer.)

- f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.
- g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.
- h. Reporting procedures, including proposed reporting formats.
- i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks and has separate control requirements. It could be identified by different trades or disciplines, or it could be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.

3.2.3 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.4 Notification of Changes

After acceptance of the CQC plan, the Contractor shall notify the Contracting Officer in writing a minimum of seven calendar days prior to any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the Quality Control Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both on-site and off-site work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance inspection. Minutes of the meeting will be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 CQC System Manager

The Contractor shall identify an individual within his organization at the site of the work who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. This CQC System Manager shall be on the site at all times during construction and shall be employed by the Contractor, except as noted in the following. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the system manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager.

3.4.2 CQC Organizational Staffing

A CQC staff shall be maintained under the direction of the CQC System Manager to perform all Quality Control activities. The actual strength of the staff during any specific work period may vary to cover work phase needs, shifts, and rates of placement. The personnel of this staff shall be fully qualified by experience and technical training to perform their assigned responsibilities and shall be directly hired by and work for the prime Contractor.

3.4.3 Organizational Changes

The Contractor shall obtain Contracting Officer's acceptance before replacing any member of the CQC staff. Requests shall include the names, qualifications, duties, and responsibilities of each proposed replacement.

3.4.4 Additional Requirement

In addition to the above requirements, the CQC System Manager shall have completed the course entitled "Construction Quality Management for Contractors" within the last 5 years. This course will periodically be offered at various locations throughout the Pacific Northwest. For information concerning this course call your local Associated General Contractor's Plan Room.

3.5 SUBMITTALS

Submittals shall be as specified in Section 01330: SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements.

3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. The controls shall be adequate to cover all construction operations, including both on-site and off-site fabrication, and shall be keyed to the proposed construction sequence. The controls shall include at least three phases of control to be conducted by the CQC system manager for all definable features of work, as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work and shall include:

- a. A review of each paragraph of applicable specifications.
- b. A review of the contract plans.
- c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- d. A check to assure that provisions have been made to provide required control inspection and testing.
- e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
- f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawing or submitted data, and are properly stored.
- g. A review of the appropriate activity hazard analysis to assure safety requirements are met.
- h. Discussion of procedures for constructing the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that phase of work.
- i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- j. The Government shall be notified at least 24 hours in advance of beginning any of the required action of the preparatory phase. This phase shall include a meeting conducted by the CQC system manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC system manager and attached to the daily QC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

- a. A check of preliminary work to ensure that it is in compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verification of full contract compliance. Verify required control inspection and testing.
- c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with sample panels as appropriate.
- d. Resolve all differences.
- e. Check safety to include compliance with and upgrading of the

safety plan and activity hazard analysis. Review the activity analysis with each worker.

- f. The Government shall be notified at least 24 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC system manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.
- g. The initial phase shall be repeated for each new crew to work on-site, or any time acceptable specified quality standards are not being met.

3.6.3 Follow-up Phase

Daily inspections shall be performed to assure continuing compliance with contract requirements, including control testing, until completion of the particular feature of work. The inspections shall be made a matter of record in the CQC documentation. Final follow-up inspections shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon or conceal non-conforming work. The Contractor shall maintain working "as-built" contract drawings as required in Section 01010 SUPPLEMENTARY REQUIREMENTS.

3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work as determined by the Government if the quality of on-going work is unacceptable; or if there are changes in the applicable QC staff or in the on-site production supervision or work crew; or if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.7 TESTS

The Contractor shall perform tests specified or required to verify that control measures are adequate to provide a product which conforms to contract requirements. Testing includes operation and/or acceptance tests when specified. A list of tests to be performed shall be furnished as a part of the CQC plan. The list shall give the test name, frequency, specification paragraph containing the test requirements, the personnel and laboratory responsible for each type of test, and an estimate of the number of tests required. The Contractor shall perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- e. Results of all tests taken, both passing and failing tests, shall be recorded on the Quality Control report for the date taken.

Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be recorded. Actual test reports may be submitted later, if approved by the Contracting Officer, with a reference to the test number and date taken. An information copy of tests performed by an off-site or commercial test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports, as stated, may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.8 COMPLETION INSPECTION

At the completion of all work or any increment thereof established by a completion time stated in Section 00800, clause: COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK or stated elsewhere in the specifications, the CQC system manager shall conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved plans and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. The CQC system manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected and so notify the Contracting Officer. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time stated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

3.9 DOCUMENTATION

The Contractor shall maintain current records of quality control operations, activities, and tests performed, including the work of subcontractors and suppliers. These records shall be on an acceptable form and shall include factual evidence that required quality control activities and/or tests have been performed, including but not limited to the following:

- a. Contractor/subcontractor and their area of responsibility.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Test and/or control activities performed with results and references to specifications/plan requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.
- d. Off-site surveillance activities, including actions taken.
- e. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- f. List instructions given/received and conflicts in plans and/or specifications.
- g. Contractor's verification statement.
- h. Work performed today, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

- i. Material received with statement as to its acceptability and storage.
- j. Identify submittals reviewed, with contract reference, by whom, and action taken.
- k. These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date(s) covered by the report, except that reports need not be submitted within 24 hours for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every seven days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC system manager. The report from the CQC system manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor at the site of the work, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

3.11

(Sample of Quality Control Report, WWD-QCR (Rev Sep 85) follows)

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 02 - SITE CONSTRUCTION

SECTION 02080

ASBESTOS ABATEMENT WORK

PART 1 GENERAL

- 1.1 GENERAL INFORMATION
- 1.2 DEFINITIONS
 - 1.2.1 Abatement
 - 1.2.2 Amended Water
 - 1.2.3 Area Monitoring
 - 1.2.4 Asbestos
 - 1.2.5 Asbestos Containing Material (ACM)
 - 1.2.6 Asbestos Control Area
 - 1.2.7 Asbestos Fibers
 - 1.2.8 Asbestos Permissible Exposure Limit (PEL)
 - 1.2.9 Authorized Person
 - 1.2.10 Encapsulate
 - 1.2.11 Encapsulant
 - 1.2.12 Excursion Limit
 - 1.2.13 Fiber Count
 - 1.2.14 Friable Asbestos Material
 - 1.2.15 Glovebag Technique
 - 1.2.16 High-Efficiency Particulate Air (HEPA) Filter
 - 1.2.17 Negative Pressure System
 - 1.2.18 Non-friable Asbestos Material
 - 1.2.19 Personal Monitoring
 - 1.2.20 Phase Contrast Illumination Microscopy (PCM)
 - 1.2.21 Prior Experience
 - 1.2.22 Qualitative Fit Tests and checks
 - 1.2.23 Quantitative Fit Tests
 - 1.2.24 Regulated Area
 - 1.2.25 Supervisory Personnel
 - 1.2.26 Surfactant
 - 1.2.27 Time Weighted Average (TWA)
 - 1.2.28 Transmission Electron Microscope Analysis (TEMA)
- 1.3 SUBMITTALS
 - 1.3.1 Asbestos Plan
 - 1.3.2 Training
 - 1.3.3 Respirator Fit Test Results
 - 1.3.4 Previous Citations
 - 1.3.5 Pressure Differential Recordings
 - 1.3.6 Air Monitoring Results
 - 1.3.7 Waste Disposal Site (WDS)
- 1.4 PROTECTION OF ADJACENT WORK AREAS
- 1.5 TITLE TO MATERIALS
- 1.6 SITE SECURITY
 - 1.6.1 Authorized Personnel
 - 1.6.2 Work Site Entry Log
- 1.7 TRAINING
 - 1.7.1 Asbestos Abatement Workers
 - 1.7.2 Supervisory Person
- 1.8 RESPIRATORY PROTECTION
 - 1.8.1 General

- 1.8.2 Respirator Fit Testing
- 1.8.3 Respirator Fit Checks
- 1.9 MEDICAL EXAMINATIONS
- 1.10 INSURANCE
- 1.11 PERMITS AND NOTIFICATIONS
- 1.12 INDUSTRIAL HYGIENIST
- 1.13 AIR MONITORING PERSONNEL
- 1.14 PROJECT DOCUMENTATION

PART 2 PRODUCTS

- 2.1 MATERIALS
 - 2.1.1 General
 - 2.1.2 Polyethylene Sheeting
 - 2.1.3 Asbestos Disposal Bags
 - 2.1.4 Disposal Drums
 - 2.1.5 Encapsulant

PART 3 EXECUTION

- 3.1 ABATEMENT WORK DESCRIPTION
- 3.2 BULK SAMPLING FOR ASBESTOS-CONTAINING MATERIALS
- 3.3 WARNING SIGNS AND LABELS
 - 3.3.1 Warning Signs
 - 3.3.2 Warning Labels
- 3.4 WORK PROCEDURES
 - 3.4.1 General
 - 3.4.2 Asbestos Waste
- 3.5 COMMENCEMENT OF WORK
- 3.6 PERSONNEL AND AREA AIR MONITORING
 - 3.6.1 Pre-Abatement Air Sampling
 - 3.6.2 Air Monitoring During Abatement Work
 - 3.6.3 Post-Abatement Air Sampling
- 3.7 SITE INSPECTION
- 3.8 DISPOSAL OF ASBESTOS CONTAINING MATERIALS
- 3.9 WASTE SHIPMENT RECORD (WSR)

-- End of Section Table of Contents --

SECTION 02080

ASBESTOS ABATEMENT WORK

PART 1 GENERAL

1.1 GENERAL INFORMATION

This section covers the removal and disposal of all asbestos-containing materials encountered during the execution of this contract. This work includes the incidental procedures and equipment required to prevent the airborne release of, and protect workers and occupants of the buildings and/or areas from contact with, asbestos fibers. During the performance of the contract, the laws, ordinances, rules, and regulations of Federal, State, Regional, and local authorities shall be complied with regarding the removal, storage, transportation, and disposal of asbestos-containing materials. Where the requirements of these specifications and Federal, State, Regional or local regulations vary, the most stringent requirements shall be enforced.

1.2 DEFINITIONS

Terms associated with removal and disposal are defined as follows:

1.2.1 Abatement

Various processes used to control asbestos containing materials in buildings. There are three alternative methods of abatement: removal, encapsulation, or enclosure of asbestos.

1.2.2 Amended Water

Water containing a wetting agent or surfactant.

1.2.3 Area Monitoring

Sampling of asbestos fiber concentrations within the asbestos control area and outside the asbestos control area which is representative of the airborne concentrations of asbestos fibers which may reach the breathing zone.

1.2.4 Asbestos

A class of magnesium-silicate minerals that occur in fibrous form. Minerals that are included in this group are chrysotile, crocidolite, amosite, anthophyllite, tremolite, and actinolite.

1.2.5 Asbestos Containing Material (ACM)

A friable or non-friable material composed of asbestos of any type and in an amount greater than 1 percent by weight, either alone or mixed with other fibrous or nonfibrous materials.

1.2.6 Asbestos Control Area

An area where asbestos abatement work is performed which is isolated by a

containment barrier to prevent the spread of asbestos dust, fibers, or debris.

1.2.7 Asbestos Fibers

Asbestos having an aspect ratio of at least 3 to 1 and are 5 micrometers or longer in length.

1.2.8 Asbestos Permissible Exposure Limit (PEL)

An 8-hour time weighted average of an airborne concentration of asbestos fibers equal to 0.1 fiber per cubic centimeter of air (0.1 f/cc).

1.2.9 Authorized Person

A person authorized to be present in the regulated areas by either the Contractor, industrial hygienist, or the Contracting Officer.

1.2.10 Encapsulate

The process whereby an encapsulant is applied to asbestos-containing materials (ACM) to control the release of asbestos fibers into the air.

1.2.11 Encapsulant

A liquid material which can be applied to ACM which controls the possible release of asbestos fibers from the material either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant).

1.2.12 Excursion Limit

A 30 minute average of an airborne concentration of asbestos fibers equal to 1.0 fiber per cubic centimeter of air (1.0 f/cc).

1.2.13 Fiber Count

The average number of asbestos fibers in a cubic centimeter (F/CC) of air.

1.2.14 Friable Asbestos Material

Material that contains more than 1 percent asbestos by weight which when dry can be crumbled, pulverized, or reduced to powder by hand pressure.

1.2.15 Glovebag Technique

A method for removing asbestos containing material from HVAC ducts, piping, valves, joints, elbows, and other nonplanar surfaces within a clear plastic containment bag. The glovebag is a premanufactured or custom fabricated bag, typically constructed of 6 mil transparent polyethylene material, that has at least two inward projecting long sleeves and gloves. The glovebag is constructed and installed in such a manner that it surrounds the object or material to be removed and contains all asbestos fibers released during the process. A portable exhaust system equipped with HEPA type filtration is used to maintain negative pressure within the glovebag enclosure relative to the pressure outside of it.

1.2.16 High-Efficiency Particulate Air (HEPA) Filter

A filter capable of trapping and retaining at least 99.97 percent of all monodispersed particles of 0.3 microns in diameter or larger.

1.2.17 Negative Pressure System

A system that has been designed to maintain a minimum pressure differential of at least minus 0.02 inches of water column in the asbestos control area relative to adjacent, unsealed areas outside of the asbestos control area.

1.2.18 Non-friable Asbestos Material

Material that contains more than 1 percent asbestos by weight in which the fibers have been locked in by a bonding agent, coating, binder, or other material so that the asbestos is bound and normally does not release fibers during any routine appropriate end-use, handling, storage, transportation, or processing. Non-friable asbestos containing material may release excessive asbestos fiber concentrations during controlled handling, abrading, sanding, drilling, cutting, machining, removal or demolition operations. Non-friable asbestos containing material is considered hazardous during abatement and disposal procedures that destroy the material's integrity.

1.2.19 Personal Monitoring

Sampling of asbestos fiber concentrations within the breathing zone of an employee.

1.2.20 Phase Contrast Illumination Microscopy (PCM)

An analytical method for counting fibers using the sampling and analytical method specified in NIOSH method 7400, latest revision.

1.2.21 Prior Experience

Experience required of the Contractor and Industrial Hygienist on asbestos projects of similar nature and scope to insure their capability of performing the asbestos removal in a satisfactory manner. Similarities shall be in areas related to material composition, project size, number of employees, and the engineering work practice and personal protection control required. A minimum of 2 years of such experience shall be mandatory for both the Contractor and the industrial hygienist.

1.2.22 Qualitative Fit Tests and checks

A group of tests that can be easily performed to test the fit of a respirator face-piece to the wearer's face. Examples are the negative and positive pressure checks, the irritant smoke test, and the isoamyl acetate (banana oil) test.

1.2.23 Quantitative Fit Tests

A group of tests that can be performed to quantitatively test the fit of a respirator face-piece to the wearer's face.

1.2.24 Regulated Area

An area established to demarcate areas where the possibility of airborne

concentrations of asbestos exceed or can reasonably be expected to exceed the permissible exposure limit.

1.2.25 Supervisory Personnel

A person who supervises activities in the regulated area. The supervisory person is capable of identifying existing asbestos hazards in the work place and has the authority to take prompt corrective measures to eliminate them. Their duties include, as a minimum, the following: establishing the negative-pressure enclosure, ensuring its integrity, and controlling entry to and exit from the enclosure; supervising all employee exposure monitoring as required; ensuring that all employees working within such enclosure wear the appropriate personal protective equipment, are trained in the use of appropriate methods of exposure control, and use the hygiene facilities and decontamination procedures specified; and ensuring that engineering controls in use are in proper operating condition and are functioning. The supervisory person must have successfully attended an EPA or State approved comprehensive course on asbestos hazards and its proper methods of abatement.

1.2.26 Surfactant

A wetting agent that reduces the surface tension of water. The three types are cationic, anionic, and non-ionic.

1.2.27 Time Weighted Average (TWA)

The TWA is an 8-hour time weighted average of airborne concentrations of asbestos fibers that have an aspect ratio of at least 3 to 1 and are 5 micrometers or longer per cubic centimeter of air.

1.2.28 Transmission Electron Microscope Analysis (TEMA)

A method for detecting and counting asbestos fibers using NIOSH method 7402. TEM analysis is typically used to confirm asbestos fiber concentrations as counted by Phase Contrast Illumination Microscopy analysis.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Asbestos Plan; G, HDC

SD-03 Product Data

The manufacturer's data, certificates of compliance, and any material safety data sheets (MSDS) for the following items:

Encapsulants;G, HDC

Respirators;G, HDC

This plan shall include a description of the methods to be used to determine the magnitude and characteristics of asbestos removal work.

SD-06 Test Reports

Bulk Sampling Results

The results of all bulk samples for suspected ACM.

Respirator Fit Test Results

Air Monitoring Personnel; G, HDC

SD-07 Certificates

Testing Laboratory; G, HDC

The name, address, and telephone number of the testing laboratory selected to perform the monitoring, testing, and reporting of airborne concentrations of asbestos fibers.

Industrial Hygienist;G, HDC

The name, address, and telephone number of the industrial hygienist selected to approve the asbestos plan and direct monitoring. In addition, a copy of certification from the American Board of Industrial Hygiene for the Industrial Hygienist shall also be submitted.

Training

Medical Examination

A certificate of compliance that includes the name, date of the most current medical examination, and the name and signature of the examining physician for all employees who have the potential to be exposed to airborne asbestos fibers in performing their assigned work.

Permits and Notification

A copy of all permits and notifications as required by Federal, State, and local agencies.

Waste Disposal Site (WDS)

Insurance

A certificate of compliance that includes the insurance company's name, agent, type of coverage, amount of coverage, policy number, and effective dates.

Previous Citations

Work Site Entry Logbook

A copy of the work site entry logbook daily for the previous work day.

Daily Narrative Log

A copy of the daily narrative log daily for the previous work day.

Pressure Differential Recordings

Air Monitoring Results

Waste Shipment Record (WSR)

A copy of the completed WSR within 10 days after the transport of any asbestos containing materials to a Waste Disposal Site and before the completion date of this contract.

1.3.1 Asbestos Plan

A detailed asbestos plan, approved and signed by the certified Industrial Hygienist, of the containment and work procedures to be used in the removal and demolition of asbestos containing materials. The plan shall include a sketch showing the location, size, and details of the asbestos control areas, location, layout, and details of the decontamination areas, and the locations of negative pressure equipment and pressure differential monitoring devices. The plan shall also include interface of trades involved in the construction, sequencing of asbestos related work, disposal plan. Product data shall be included for the type of wetting agent to be used, air monitoring equipment, respirators, protective equipment, pressure differential monitoring device, and a detailed description of the method to be employed in order to control pollution. Prior to the start of any abatement work, the Contractor and the certified Industrial Hygienist shall meet with the Government to discuss in detail the asbestos plan including work procedures and safety precautions.

1.3.2 Training

Certificates of training verifying that each employee has successfully passed an EPA or State certified asbestos worker course and has a current asbestos worker identification card. Certificates indicating the successful completion of an EPA or State approved "Asbestos Abatement Supervisory Personnel" course shall be submitted for those persons to be so designated for this abatement project.

1.3.3 Respirator Fit Test Results

A record of the most recent respirator fit test for each employee required to wear a respirator during the performance of their work. The respirator fit test results shall include as a minimum the following information:

- a. Type of respirator fit test used and agent.
- b. Specific make, model, size, and approval number of the respirator tested.
- c. Name of the person tested.
- d. Name of the test operator.

- e. Date of the test.
- f. Results of the respirator fit test.

1.3.4 Previous Citations

A list of any citation and their resulting penalties issued by Federal, State, or Local regulatory agencies relating to asbestos abatement activities. This list shall include the name of the project, dates, and resolutions. In addition, a list of any asbestos related contract that has been terminated prior to its completion shall also be submitted. This list shall include the project's name, date, and reasons for termination.

1.3.5 Pressure Differential Recordings

If required by the approved abatement plan, pressure differential recordings of the negative pressure system for each workday reviewed by the industrial hygienist, or designee, submitted on site within 24 hours from the end of each workday.

1.3.6 Air Monitoring Results

Fiber counting shall be completed and results reviewed by the industrial hygienist, or their designee, within 1 hour of the time the samples were taken. Monitoring results, signed by the testing laboratory employee performing the air monitoring, and the employee that analyzed the sample shall be submitted on site within 3 working days.

1.3.7 Waste Disposal Site (WDS)

Prior to disposal, written evidence stating that the landfill for disposal is approved for asbestos disposal by the State and local regulatory agencies.

1.4 PROTECTION OF ADJACENT WORK AREAS

All asbestos removal shall be performed without contamination of adjacent work areas. Where such work contaminates adjacent work areas, these areas shall be decontaminated.

1.5 TITLE TO MATERIALS

Asbestos containing materials resulting from the abatement work will remain the property of the Government and shall be disposed of as specified herein.

1.6 SITE SECURITY

1.6.1 Authorized Personnel

During abatement work, the regulated area shall be restricted to only authorized, trained, and protected personnel. These personnel may include the Contractor's employees, the Government authorized representatives, State and local inspectors, and any other designated individuals. A list of authorized personnel shall be established prior to the initiation of work and the Contractor shall be responsible for site security during the abatement work.

1.6.2 Work Site Entry Log

A work site entry logbook shall be kept with the list of the names of all workers and visitors including the date and time of entry and departure that enter the asbestos control area.

1.7 TRAINING

1.7.1 Asbestos Abatement Workers

All personnel who are exposed to, or might reasonably be expected to be exposed to, airborne concentrations of asbestos at or above the permissible exposure limit, are required to have successfully completed an Environmental Protection Agency approved or State accredited asbestos abatement workers course. Successful completion of the course shall be prior to the time of initial assignment and an annual refresher course thereafter.

1.7.2 Supervisory Person

Personnel to be designated as "Supervisory Persons" for this abatement project shall have successfully completed an Environmental Protection Agency approved or State accredited Contractor/supervisor 40-hour course. Successful completion of the course shall be prior to the time of initial assignment and an annual refresher course is required thereafter.

1.8 RESPIRATORY PROTECTION

1.8.1 General

As a minimum, half-mask air-purifying respirators equipped with high-efficiency particulate air (HEPA) filters shall be used during all abatement work. Respirators providing greater protection for higher environmental concentrations of asbestos fibers shall be required, if their use is dictated by air sampling results. All respirators shall be jointly approved by the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH). Each asbestos worker shall be provided with a personally issued and individually identified respirator.

1.8.2 Respirator Fit Testing

Each respirator issued to the worker shall be properly fitted. A qualitative respirator fit test shall be used to determine the ability of each worker to obtain a satisfactory fit. A respirator fit test shall be performed for each worker on initial fitting of the respirator and at least every 6 months thereafter. Fit test procedures shall be used as specified in 29 CFR 1926.58, Appendix C, "Qualitative and Quantitative Fit Testing Procedures".

1.8.3 Respirator Fit Checks

The workers shall be required to perform a positive and negative pressure fit check each time a respirator is worn.

1.9 MEDICAL EXAMINATIONS

As a minimum, a medical examination shall be given to each abatement worker on an annual basis. The content of the examination shall be consistent with

the requirements set forth in 29 CFR 1926.58 (m) (2) (ii).

1.10 INSURANCE

A "per occurrence" insurance policy in the minimum amount of \$2,000,000 shall be required to protect against any asbestos related claim that may arise out of or result from the Contractor's activities under this contract.

1.11 PERMITS AND NOTIFICATIONS

All permits relating to the asbestos removal, storage, hauling, and disposition, as required to perform the work described herein shall be the Contractor's responsibility. Timely notification of such actions as may be required by Federal, State, regional, and local agencies is the sole responsibility of the Contractor, including notification of the State's Environmental Protection Agency and the Contracting Officer in writing at least 10 working days prior to the commencement of work in accordance with 40 CFR 61.145 (b) and 40 CFR 2H.

1.12 INDUSTRIAL HYGIENIST

The industrial hygienist shall be certified by the American Board of Industrial Hygiene and have a minimum of 2 years of prior experience working on asbestos related projects. The project's Industrial Hygienist may be a professional engineer or certified safety professional with a minimum of 5 years experience in industrial hygiene, including 2 years of prior experience working on asbestos related projects. This individual shall not be affiliated in any way other than through this contract with the Contractor performing the abatement work.

1.13 AIR MONITORING PERSONNEL

Personnel performing air monitoring shall have, as a minimum, 1 year experience in the analysis of air samples and shall have successfully completed the NIOSH 582 course. In addition, within the past year the persons counting the samples shall have been judged proficient by their successful participation in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing (PAT) Program. In lieu of this requirement, the individual performing the monitoring, testing and reporting shall participate and be listed on the Asbestos Analysis Registry. The testing laboratory that employs the air monitoring personnel shall be currently accredited by the National Institute for Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP) for bulk asbestos analysis. Air monitoring personnel shall not be affiliated in any way other than through this contract with the Contractor performing the abatement work.

1.14 PROJECT DOCUMENTATION

Maintain and have available for inspection at the job site, the following:

a. Daily Narrative Log.

A daily narrative log kept by the industrial hygienist or his designee shall be maintained. This log shall document the major events which occur each day. This log shall provide a comprehensive description of conditions in and around the job site. It shall include the names of all persons who visit the job site and all persons who enter the sealed or restricted work

areas. It shall contain the details of all accidents, emergencies, breakdowns of equipment, and any material, procedural or safety difficulties including issues and complaints brought to management attention by the Contractor's employees. It shall contain details such as the number of persons on the job, the time they entered the work area and the time they left, and the nature of the work-in-progress. Each day's entries shall be signed and dated by the person who made them.

b. Personnel and Area Air Monitoring Log.

A daily air monitoring log which records all required items outlined in paragraph "PERSONNEL AND AREA AIR MONITORING"

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 General

Deliver all the materials in their original packages, containers, or bundles bearing the name of the manufacturer and where applicable, the brand name. Store all materials subject to damage off the ground, away from wet or damp surfaces, and under cover sufficient enough to protect them from damage or contamination. Replacement materials shall be stored outside of the work area until abatement is completed.

2.1.2 Polyethylene Sheeting

Polyethylene sheeting used for walls and floors shall have a minimum thickness of 6-mils. Polyethylene sheeting utilized for worker decontamination enclosures shall be opaque white or black in color. All polyethylene sheeting shall be used in widths selected to minimize the frequency of joints. Methods of attaching polyethylene sheeting to the building or structures in the building shall be submitted for approval. The method submitted shall be selected to minimize damage to equipment and surfaces; any resulting damage shall be the responsibility of the Contractor to repair at no additional cost to the Government.

2.1.3 Asbestos Disposal Bags

Disposal bags shall be of 6 mil polyethylene, pre-printed with labels as required in paragraph "WARNING SIGNS AND LABELS"

2.1.4 Disposal Drums

If used, disposal drums shall be metal or plastic with locking ring tops and shall be labeled as required in paragraph "WARNING SIGNS AND LABELS"

2.1.5 Encapsulant

The encapsulant shall be the bridging or penetrating type, depending on the particular application. The encapsulant shall not be solvent-based, utilize a vehicle consisting of hydrocarbons or be flammable. All encapsulants shall have been EPA approved prior to their application.

PART 3 EXECUTION

3.1 ABATEMENT WORK DESCRIPTION

The work includes the removal and disposal of all asbestos containing materials encountered during the execution of this contract. These materials may be found in, but are not limited to, the flooring material in the crane cab and electrical wiring insulation utilized throughout the bridge crane. With the exception of the crane cab flooring material, all suspect asbestos containing materials encountered during the execution of this contract shall be sampled in accordance with the requirements of Paragraph "BULK SAMPLING FOR ASBESTOS-CONTAINING MATERIALS"

3.2 BULK SAMPLING FOR ASBESTOS-CONTAINING MATERIALS

Prior to the disturbance of any suspected ACM, the Contractor shall have representative samples of the material taken by an trained and certified asbestos building inspector. The samples shall be taken in a manner that will not allow the release of airborne fibers and the sampling procedures shall be in compliance with all Federal and State requirements. The samples shall be transported to an approved testing laboratory for analysis of the material. Until sample results have been returned and reviewed by the GQAR, the Contractor shall handle all suspected materials as asbestos-containing. Bulk sampling results shall be submitted and shall include, as a minimum, the type of asbestos-containing material, approximate amount (percentage by weight), condition, and its location in the work area.

3.3 WARNING SIGNS AND LABELS

3.3.1 Warning Signs

Warning signs shall be posted at all approaches to any location where airborne concentrations of asbestos may be expected to exceed ambient background levels. Signs shall be posted at a distance sufficiently far enough away from the work area to permit an employee to read the sign and take the necessary protective measure to avoid exposure. Warning signs shall be provided that are of sufficient size to be clearly legible, printed on a contrasting background, and display the following legend:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE
CLOTHING ARE REQUIRED
IN THIS AREA

3.3.2 Warning Labels

Warning labels shall be affixed on all containers that store asbestos waste materials. The warning label shall be legible, printed in large bold letters on a contrasting background, and display the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST

CANCER AND LUNG DISEASE HAZARD

3.4 WORK PROCEDURES

3.4.1 General

All asbestos abatement work shall be performed by certified asbestos abatement workers, under the direct supervision of the approved Contractor's supervisory personnel. Abatement work shall be performed as detailed in the approved asbestos abatement plan, unless alternative procedures have been submitted and approved. No abatement work shall proceed without a GQAR present to witness the work. The Contracting Officer shall be notified in writing at least seven days prior to each individual occurrence of abatement work. All asbestos work shall be performed in accordance with 29 CFR 1926.58, 40 CFR 241, state and local regulations and the requirements specified herein. Eating, smoking, drinking, chewing tobacco, or gum shall not be permitted in the regulated area. Personnel of other trades not engaged in the removal and disposal of asbestos containing materials shall not be in the regulated area.

3.4.2 Asbestos Waste

Asbestos waste shall be placed in approved containers, and caution labels applied on the containers in accordance with 20 CFR 1926.58 (k), (2), if not already preprinted on the containers. External surfaces of the filled containers shall be thoroughly cleaned by wet sponging prior to being transported out of the regulated areas. Bags shall not be overfilled and shall be securely sealed to prevent accidental opening and leakage by twisting and taping the tops of bags in a goose neck fashion. Bags shall be placed in drums for staging and transportation to the approved landfill.

Asbestos containing waste with sharp-edged components, or which may puncture the disposal bags or plastic sheeting, shall be placed into approved disposal drums and sealed with locking ring tops.

3.5 COMMENCEMENT OF WORK

Commencement of abatement work shall not occur until:

- a. All pre-abatement submittals, notifications, postings, and permits have been provided and approved.
- b. All required enclosure systems (if used) have been constructed and tested.
- c. Negative pressure systems (if used) are functioning properly.
- d. All equipment for abatement, clean-up, and disposal are on-site.
- e. The Contractor receives written permission to commence abatement.

3.6 PERSONNEL AND AREA AIR MONITORING

Monitoring of airborne concentrations of asbestos fibers shall be in accordance with 29 CFR 1926.58. All air monitoring shall be performed by the Industrial Hygienist, or their approved designee and shall include as a minimum, pre-abatement, personal, area, and post-abatement air samples as required by Federal, State, and local regulations. Analysis of the air samples shall be performed at the work site, unless otherwise approved. The Industrial Hygienist, or their designee, shall notify the Contractor,

and the Government on site immediately of the results of any air sample that indicates airborne fiber concentrations in excess of the acceptable limits.

3.6.1 Pre-Abatement Air Sampling

Area air samples shall be taken for each asbestos removal site and the reference TWA established prior to the start of any abatement work. The number of general air samples required to be taken to establish the reference TWA for each abatement site shall be determined by the Industrial Hygienist and submitted for approval in the abatement plan.

3.6.2 Air Monitoring During Abatement Work

Personal and area air monitoring shall be provided and the TWA and excursion exposure levels shall be established during the first exposure to airborne concentrations of asbestos. Thereafter, provided the same type of work is performed, air monitoring shall be provided at a frequency as designated by the Industrial Hygienist. If monitoring outside the asbestos control area shows airborne concentrations have reached the action level, work shall be stopped and the Government on site notified immediately. The condition(s) causing this increase shall be corrected prior to the continuance of any abatement work.

3.6.3 Post-Abatement Air Sampling

Area air samples shall be taken, under aggressive conditions, to establish the clearance TWA in the asbestos control area. A maximum TWA of less than 0.01 fibers/cc shall be established after final cleanup and before removal of the containment barrier. The fiber counts from these samples shall be less than 0.01 fibers/cc or less than or equal to the reference TWA whichever is less. Should any of the final samplings indicate a higher value, appropriate actions shall be taken by the Contractor to reclean the area and the area air sampling repeated.

3.7 SITE INSPECTION

While performing asbestos removal work, the Contractor shall be subject to on-site inspection. If the work is in violation of specification requirements or any Federal, State, or local regulations, a stop work order will be issued to be in effect immediately and until the violation is resolved. Standby time and expenses required to resolve the violation shall be at the Contractor's expense.

3.8 DISPOSAL OF ASBESTOS CONTAINING MATERIALS

Asbestos containing materials shall be disposed of by burial at a State-permitted sanitary landfill. The asbestos containing materials shall be hauled to the landfill in a closed container and all procedures for hauling and disposal shall comply with 40 CFR 61 Subpart M, 40 CFR 241 and 257, 49 CFR 171 and 172, and State, and local standards. ACM shall not be allowed to accumulate on site for more than 90 days.

3.9 WASTE SHIPMENT RECORD (WSR)

A WSR shall be completed and submitted for this contract as specified in CFR 40 Part 61, subpart M and other state waste manifest shipment records within 10 days of delivery to the landfill.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 05 - METALS

SECTION 05101

METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS

PART 1 GENERAL

- 1.1 GENERAL INFORMATION
- 1.2 REFERENCES
- 1.3 SUBMITTALS
- 1.4 Bridge Crane Shop Drawings
- 1.5 INSPECTIONS AND TESTS
 - 1.5.1 Inspections and Tests
 - 1.5.2 Structural Weldments
 - 1.5.2.1 General
 - 1.5.2.2 Non-destructive Inspection
 - 1.5.2.3 Destructive Inspection

PART 2 PRODUCTS

PART 3 EXECUTION

- 3.1 STRUCTURAL FABRICATION
 - 3.1.1 General
 - 3.1.2 Dimensional Tolerances for Structural Work
 - 3.1.3 Structural Steel Fabrication
- 3.2 WELDING
 - 3.2.1 General
 - 3.2.2 Filler Metal
 - 3.2.3 Qualification of Welders and Welding Operators
 - 3.2.4 Workmanship Requirements
 - 3.2.4.1 Welding Procedures
 - 3.2.4.2 Preheat and Interpass Temperature
 - 3.2.4.3 Stress-Relief Heat Treatment
 - 3.2.5 Welding of Dissimilar Ferrous Metals and Stainless
- 3.3 INSPECTION
 - 3.3.1 General
 - 3.3.2 Contractor's Quality Control (CQC) Welding Program
 - 3.3.2.1 General
 - 3.3.2.2 Inspection
 - 3.3.2.3 Inspection Agency
 - 3.3.2.4 Inspection Procedure
 - 3.3.2.5 Acceptability of Welds
 - 3.3.2.6 Repairs
 - 3.3.3 Government Quality Assurance Program (GQAP)
 - 3.3.3.1 General
 - 3.3.3.2 Non-Destructive Inspection
 - 3.3.3.3 Test Coupons
 - 3.3.3.4 Steel Castings
- 3.4 MACHINE WORK
 - 3.4.1 General
 - 3.4.2 Finished Surfaces
 - 3.4.3 Unfinished Surfaces
 - 3.4.4 Pin Holes

- 3.4.5 Shafting
- 3.5 ZINC COATINGS
- 3.6 SHOP INSPECTION
- 3.7 PROTECTION OF MACHINED SURFACES
- 3.8 BOLTED CONNECTIONS
 - 3.8.1 General
 - 3.8.2 Bolt Holes
 - 3.8.2.1 Regular Bolts
 - 3.8.2.2 Fitted Bolts
 - 3.8.2.3 High Strength Bolts
- 3.9 SET SCREWS
- 3.10 SPECIAL NONDESTRUCTIVE TESTING

-- End of Section Table of Contents --

SECTION 05101

METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS

PART 1 GENERAL

1.1 GENERAL INFORMATION

This section covers general workmanship requirements, applicable to the fabrication and inspection of various items of metalwork and machine work. These requirements are in addition to those contained in the specification sections covering the specific items of work or as shown.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

- ASME B4.1 (1967; R 1994) Preferred Limits and Fits for Cylindrical Parts
- ASME B46.1 (2002) Surface Texture (Surface Roughness, Waviness, and Lay)

ASTM INTERNATIONAL (ASTM)

- ASTM A 123 (2002) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- ASTM A 325 (2004) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- ASTM A 490 (2004) Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
- ASTM A 780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

AMERICAN WELDING SOCIETY, INC. (AWS)

- AWS D1.1 (2002) Structural Welding Code-Steel
- AWS QC1 (1996) Standard for AWS Certification of Welding Inspectors

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Bridge Crane;G, HDC

SD-05 Design Data

Welding Procedures;G, HDC

Three copies of the complete schedules of welding procedures as described in paragraph: Welding Procedure and other required procedures.

Qualification of Welders and Welding Operators; G, HDC

Inspection Agency Qualifications; G, HDC

Welding repair plan; G, HDC

1.4 Bridge Crane Shop Drawings

Shop drawings including catalog cuts, templates, fabrication and assembly details and type, grade and class of materials as appropriate. A list shall be furnished designating the material to be used for each item. The shop drawings shall be complete and show all material machining allowances and other details that the shop personnel require to fabricate the items. The Contractor is responsible for checking the fit and dimensions shown on the plans prior to fabrication and machining of the parts. Information or elements of fabricated items omitted on the contract drawings but necessary for shop fabrication shall be detailed and indicated on the shop drawings.

1.5 INSPECTIONS AND TESTS

1.5.1 Inspections and Tests

Inspections and tests shall be performed in accordance with this section and in conjunction with SECTION 01451 to demonstrate that the fabrication and machine work are in conformity and in addition to the applicable inspection requirements elsewhere specified. A detailed plan shall be prepared as part of the CQC Plan to record all measurements, and other details that indicate the plans and specifications are met. These tests and inspections shall be performed at the Contractor's expense, certified, and available for review. Inspections and tests shall conform to the requirements of the particular sections of these specifications and plans for the respective items of work unless otherwise specified or authorized. The Government will notify the Contractor which inspections and tests shall be conducted in the presence of and witnessed by the GQAR. The Government shall be notified of the dates of the inspections and tests as required in SECTION 01451.

1.5.2 Structural Weldments

1.5.2.1 General

Inspection shall be made of each weldment to show that the completed unit meets all the details shown or specified. Records shall be kept of each inspection.

1.5.2.2 Non-destructive Inspection

When doubt exists as to the soundness of any weldment, such weldment shall be subjected to any form of non-destructive inspection as directed. This may include ultrasonic, magnaflux, dye penetrant, x-ray, gamma ray or any other test that will thoroughly inspect the weldment in question. The cost of such inspection will be borne by the Government only if the weldment is determined to meet the specifications. The cost of the inspection for weldments found unsound shall be borne by the Contractor. Any unsound weldments will be rejected and shall be replaced and re-inspected at the Contractor's expense.

1.5.2.3 Destructive Inspection

When doubt exists as to the soundness of any weldment that cannot be resolved by non-destructive inspection, coupons shall be taken for destructive inspection as directed. The cost of such inspection, repair, or replacement will be borne by the Government only if the weldment is determined to meet the specifications. The cost of the inspection for weldments found unsound shall be borne by the Contractor. Any unsound weldments will be cause for rejection and rejected weldments shall be repaired or replaced and re-inspected at the Contractor's expense.

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

3.1 STRUCTURAL FABRICATION

3.1.1 General

Material must be straight before being laid off or worked. If straightening is necessary it shall be done by methods that will not impair the metal. Sharp kinks or bends shall be cause for rejection of the material. Material with welds will not be accepted except where welding is definitely specified, indicated on the drawings or otherwise approved. Bends shall be made by dies, press brakes or bending rolls normally used in this type of fabrication. Where heating is required, precautions shall be taken to avoid overheating the metal and it shall be allowed to cool in a manner that will restore the original properties of the metal. Proposed flame cutting of material other than structural steel shall be subject to approval and shall be indicated on shop drawings. Shearing shall be accurate and all portions of the work shall be neatly finished. Corners shall be square and true unless otherwise shown. Re-entrant cuts shall be filleted to a minimum radius of 3/4-inch unless otherwise approved. Finished members shall be free of twists, bends and open joints.

3.1.2 Dimensional Tolerances for Structural Work

Dimensions shall be measured by an approved calibrated steel tape of approximately the same temperature as the material being measured at the time of measurement. The overall dimensions of an assembled structural unit shall be within the tolerances shown or as specified in the particular section of these specifications for the item of work. Where tolerances are not specified in other sections of these specifications or shown an allowable variation of 1/32-inch is permissible in the overall length of component members with both ends milled, and component members without milled ends shall not deviate from the dimensions shown by more than 1/16-inch for members 30 feet or less in length and by more than 1/8-inch for members over 30 feet in length.

3.1.3 Structural Steel Fabrication

Structural steel may be cut by mechanically guided or hand guided torches provided an accurate profile with a surface that is smooth and free from cracks and notches is obtained. Surfaces and edges to be welded shall be prepared in accordance with AWS D1.1, Subsection 3.2. Where structural steel is not to be welded and is not exposed to view, grinding will not be required except as necessary to remove slag and sharp edges of mechanically guided or hand guided cuts. Hand or mechanically guided cuts which are to be exposed or visible shall be chipped, ground or machined to sound metal. All exposed edges shall be ground to provide a radius, approximately 1/16 inch minimum.

3.2 WELDING

3.2.1 General

Unless otherwise authorized or specified, welding shall be by an electric arc welding process using a method which excludes the atmosphere from the molten metal. Welding shall conform to AWS D1.1 (Section 8, Statically Loaded Structures, does not apply) and procedures in ASME, Section 9, for welding of stainless steel. All mandatory appendices will be considered part of AWS D1.1 and therefore apply. The nonmandatory appendices and commentary will be used as guides and supplementary information unless otherwise specified for the interpretation and application of AWS D1.1.

3.2.2 Filler Metal

The electrode, electrode-flux combination and grade of weld metal shall conform to the appropriate AWS specification for the base metal or metals and welding process being used or shall be as shown where a specific choice of AWS specification allowables is required. Only low hydrogen electrodes shall be used for shielded metal-arc welding. The AWS designation of the electrodes to be used shall be included in the schedule of welding procedure to be furnished. The filler metal shall meet the requirements of AWS D1.1, Section 4 and as specified on drawings or on the approved procedure for welding of stainless steel.

3.2.3 Qualification of Welders and Welding Operators

Welding operators, welders, and tack welders shall be qualified for the particular type of work to be done. Qualification shall be in accordance with AWS D1.1. The welders and welding operators so qualified shall be certified and approved by name prior to any welding being performed by that individual. The qualifications shall be submitted on Form E-4, Appendix E

of AWS D1.1 or equal. Prior qualification may be accepted provided the welder has performed satisfactory work in accordance with AWS D1.1 within the preceding 6 months. The welder or welding operator shall be required to repeat the qualifying tests when, in the opinion of the GQAR, their work indicates a reasonable doubt as to their proficiency. Certification shall be submitted for those passing the test and upon approval, they shall be considered qualified. Those not passing shall be disqualified until passing. All expenses in connection with qualification or requalification shall be borne by the Contractor.

3.2.4 Workmanship Requirements

3.2.4.1 Welding Procedures

The approved weld procedure shall consist of detailed procedure specifications for each required joint to be welded with tables or diagrams showing the procedure to be used. The weld procedure shall be submitted on Form E-1 or E-2, Appendix E of AWS D1.1 or equal. Properly documented evidence of compliance with all requirements of these specifications for previous welding joint qualifications tests will establish the joint welding procedure as prequalified and a qualification test will not be required. Each procedure shall be clearly identified as being either prequalified or qualified by tests.

3.2.4.2 Preheat and Interpass Temperature

Preheating shall be performed as required by AWS D1.1 or as otherwise specified. The weldments to be preheated shall be slowly and uniformly heated by approved means to the prescribed temperature, held at that temperature until the welding is completed and then permitted to cool slowly in still air.

3.2.4.3 Stress-Relief Heat Treatment

If stress-relief heat treatment is needed it shall be done in accordance with the requirements of AWS D1.1, Subsection 4.4.

3.2.5 Welding of Dissimilar Ferrous Metals and Stainless

Welding of dissimilar ferrous metals and stainless shall conform to the applicable requirements of Section IX of the current ASME Boiler and Pressure Vessel Code for "Weldings Qualifications," respectively, and the following additional requirements:

- a. Welders, welding operators and machines shall be qualified for both materials being welded.
- b. Electrodes and welding procedures shall have been previously demonstrated by test to be effective in achieving sound welded joints with equivalent dissimilar metals or stainless steel.
- c. Preheat temperature shall be the higher of the specified preheat temperatures for the two materials being joined.
- d. Special welding procedures shall be submitted for approval for these joints either approved by or prepared by competent metallurgist whose qualifications have been previously submitted and approved.

e. Except where high strength joints are specifically required, selection of welding electrodes shall include:

(1) Austenitic filler shall be used for welding any chromium steel to an austenitic steel.

(2) Filler metal containing chromium equal to either the higher or lower chromium content of either material shall be used for welding a hardenable chromium steel to another with a chromium content.

(3) Unless otherwise shown, filler metal for welding stainless steel to a carbon steel may be the specified carbon steel filler provided; (i) a high strength joint is not specified; (ii) the affect of hardening is controlled; and (iii) previously fabricated and tested weld test specimens with the equivalent base metals to be joined. In the event the proposed carbon steel weld rods are determined to be unsuitable by test, the Contractor shall use only an appropriate pretested alloy steel filler rod which will produce sound welds.

(4) Unless otherwise shown, filler metal for welding any chromium steel to any low alloy steel shall be (i) of the same composition as the low alloy steel provided the alloying elements are essential for the service application (ii) any low alloy composition that will provide the mechanical properties for the service application.

(5) Austenitic filler rod may be used generally for joining two dissimilar steels except where control of carbon migration is required.

3.3 INSPECTION

3.3.1 General

All welding shall be inspected to ensure that the welds conform to the requirements this specification, AWS D1.1, or ASME SECTION IX and the approved welding procedure. Inspection will be performed in two categories: 1) The CQC Welding Program shall guarantee complete compliance of all welds with the contract requirements, and 2) The Government Quality Assurance Program (GQAR) will be utilized to verify implementation and acceptability of the CQC Welding Program.

3.3.2 Contractor's Quality Control (CQC) Welding Program

3.3.2.1 General

Inspection performed under the CQC Welding Program shall be in accordance with the specifications herein and Section 6 of AWS D1.1. The Contractor's weld inspector shall hold a current certification as a certified welding inspector (CWI) in accordance with AWS QC1. Copies of the weld inspector's certification and qualifications for all assistant inspectors shall be submitted.

3.3.2.2 Inspection

Inspection and tests shall be performed as necessary prior to welding, during welding, and after welding to ensure that materials and workmanship

meet the requirements specified. In addition to visual inspection, all welds shall be subject to non-destructive inspection. As a minimum the following amount of non-destructive inspection shall be performed for each fabricated weldment:

- a. Ten percent of the full penetration welds shall be inspected by ultrasonic testing,
- b. Ten percent of the groove welds shall be inspected by ultrasonic testing,
- c. Ten percent of the fillet welds shall be inspected by magnetic particle testing or liquid penetrant testing, and
- d. Radiographic inspection shall be performed on welds designated on the drawings.
- e. The samples shall be randomly selected and shall be representative of the welds on that weldment.

Any weld that does not meet the acceptance criteria shall not be counted as meeting the above inspection requirements. Rejection of any portion of a weld inspected on less than a 100 percent basis, by a method other than visual, shall be 100 percent inspected by the method used in finding the defect. This inspection will not count towards meeting the above quality requirements.

3.3.2.3 Inspection Agency

Non-destructive inspection of welds and evaluation of tests or inspections as to the acceptability of the welds shall be performed by an agency adequately equipped and qualified to perform such services; or the Contractor may make its own tests or inspections and evaluations, provided the Contractor has available suitable equipment and qualified personnel. In either case, the Inspection Agency qualifications or Contractor's personnel qualifications shall be submitted for approval. The evaluation of the tests or inspections shall be subject to approval and all records shall become the property of the Government. Testing performed as part of the GQAP shall be made in the presence of the GQAR.

3.3.2.4 Inspection Procedure

The procedure for making, evaluating and reporting the radiographic testing, ultrasonic testing, magnetic particle inspection, and liquid penetrant inspection of the welds shall conform to the requirements of AWS D1.1. The ultrasonic equipment shall be capable of making a permanent record of the test indications and a record shall be made of each weld tested.

3.3.2.5 Acceptability of Welds

All welds shall meet the inspection requirements of AWS D1.1, Section 9.25 for visual, radiographic, ultrasonic, magnetic particle, and liquid penetrant as applicable for the procedure specified.

3.3.2.6 Repairs

Defective welds shall be repaired in compliance with AWS D1.1, Section 3.7. A welding repair plan shall be submitted for approval before repairs are

made. Defective weld metal shall be removed to sound metal by use of air carbon-arc and/or grinding. Except for repairs of members cut to remove test coupons that were found to have acceptable welds, costs of repairs and retesting shall be borne by the Contractor.

3.3.3 Government Quality Assurance Program (GQAP)

3.3.3.1 General

All welds shall be subject to inspection by the Government. The Government reserves the right to require the Contractor to conduct non-destructive examination of any weld by any of the methods listed below. The GQAR may require that coupons to be cut from any location in any joint

3.3.3.2 Non-Destructive Inspection

As directed by the GQAR non-destructive examination of the designated welds shall be performed by one of the following methods. See bid schedule for anticipated quantities of weld inspection, quantities are an estimate and higher or lower amounts may be required as directed by the Government.

- a. Radiographic inspection.
- b. Ultrasonic inspection.
- c. Magnetic Particle inspection.
- d. Dye Penetrant inspection.

These welds shall meet the acceptance standards based upon the respective welds and method of inspection specified in paragraph 3.2.6.2.2 regardless of the method used by the Government to inspect the weld. Ultrasonic or radiographic inspection may be used to ensure proper visual inspection was performed at all stages of the welding process, according to AWS D1.1, Section 6.6.1. Rejected welds found by the GQAP shall be inspected the full length of that weld by the Contractor at its expense using the NDT method which found the first defect in the weld.

3.3.3.3 Test Coupons

The Government reserves the right to require the Contractor to remove coupons from completed work when in doubt as to soundness cannot be resolved by non-destructive inspection. Coupons will be subjected to a guided bend test. Should tests of any two coupons cut from the work of any welder show non-conformance with AWS D1.1, it will be considered evidence of negligence or incompetence, and such welder shall be removed from the work. When coupons are removed from any part of a structure, the members cut shall be repaired with joints which conform to AWS D1.1 or ASME SECTION IX, with peening as approved or directed to relieve residual stress.

3.3.3.4 Steel Castings

Unsound material shall be removed from the surfaces of steel castings which will be incorporated into welded connections by chipping, machining, air-arc gouging, or grinding. Major connections, designed for transfer of stresses, shall not be welded if the temperature of the castings is lower than 100° F. Castings containing over 0.35 percent carbon or over 0.75 percent manganese shall be preheated to a temperature no to exceed 450° F and welding shall be accomplished while the castings are maintained at

temperature above 350° F. Welding will not be permitted on castings containing carbon in excess of 0.45 percent, except on written authorization by Contracting Officer. Castings requiring welding repair after the first annealing and casting involving welding fabrication shall be stress-relieved annealed prior to receiving final machining unless otherwise permitted by GQAR.

3.4 MACHINE WORK

3.4.1 General

Tolerances, allowances and gages for metal fits between plain, non-threaded, cylindrical parts shall conform to ASME B4.1 for the class of fit shown or to the dimensions shown. Where fits are not shown they shall be in accordance with good industrial practice for the intended application and approved prior to the beginning of work. Tolerances for machine-finished surfaces designated by non-decimal dimensions shall be within 1/64-inch unless otherwise specified. Sufficient excess material stock shall be allowed on surfaces requiring machining to ensure true surfaces of solid material while maintaining the specified minimum or finished plate thickness. Finished contact or bearing surfaces shall be true and exact to secure full contact. All surfaces shall be finished in accordance with the contract drawings to ensure proper operation when assembled. Parts shall be accurately machined and all like parts shall be interchangeable. All drilled bolt holes shall be accurately located to ensure interchangeability.

3.4.2 Finished Surfaces

Surface finishes as indicated or specified shall be in accordance with ASME B46.1. Values of required roughness heights are arithmetical average deviations expressed in micro inches. These values are maximum. Lesser degrees will be satisfactory unless otherwise indicated. Compliance with surface requirements shall be determined by sense of feel and visual inspection of the work compared to Roughness Comparison Specimens in accordance with the provisions of ASME B46.1. Values of roughness width and waviness height shall be consistent with the general type of finish specified by roughness height. Where the finish is not indicated or specified it shall be that which is most suitable for the particular surface, provide the class of fit required and shall be indicated on the shop drawings by a symbol which conforms to ASME B46.1 when machine finishing is provided. Flaws such as scratches, ridges, holes, peaks, cracks or checks which will make the part unsuitable for the intended use will be cause for rejection.

3.4.3 Unfinished Surfaces

All work shall be laid out to secure proper matching of adjoining unfinished surfaces unless otherwise directed. Where there is a discrepancy between adjoining unfinished surfaces they shall be ground smooth or machined to secure proper alignment. Unfinished surfaces shall be true to the lines and dimensions shown and shall be ground free of all projections and rough spots. Depressions or holes not affecting the strength or usefulness of the parts shall be filled in using an approved method.

3.4.4 Pin Holes

Pin holes shall be bored in accordance with the dimensions and tolerances

shown or noted.

3.4.5 Shafting

All shafting shall be as shown or noted. Fillets shall be provided where changes in section occur. Cold-finished shafting may be used where keyseating or grinding are the only machine work required.

3.5 ZINC COATINGS

Zinc coatings shall be applied in a manner and of a thickness and quality conforming to ASTM A 123. Where zinc coatings are destroyed by cutting, welding, or other causes, the affected areas shall be regalvanized. Coatings 2 ounces or heavier shall be regalvanized with a suitable low-melting zinc base alloy similar to the recommendations of the American Hot-Dip Galvanizers Association to the thickness and quality specified for the original zinc coating. Coatings less than 2 ounces shall be regalvanized by a repair compound conforming to ASTM A 780.

3.6 SHOP INSPECTION

Each structural unit shall be inspected prior to assembly to determine the correctness of the fabrication and machining of the component parts. Tolerances shall not exceed those shown. Each unit inspected shall be closely checked to ensure that dimensions and tolerances are met. An inspection record shall be kept for review by the GQAR for each item inspected.

3.7 PROTECTION OF MACHINED SURFACES

Machined surfaces shall be thoroughly cleaned of foreign matter and shall be protected by suitable means. Unassembled pins and bolts shall be oiled and wrapped with moisture resistant paper or protected by other approved means.

3.8 BOLTED CONNECTIONS

3.8.1 General

Bolts, nuts, and washers shall be of the type specified or indicated on the drawings. All nuts shall be equipped with washers except for high strength bolts. Beveled washers shall be used where bearing faces have a slope of more than 1:20 with respect to a plane normal to the bolt axis. Where the use of high strength bolts is specified, the materials, workmanship, and installation shall conform to the applicable provisions of the specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts issued by the Research Council on Riveted and Bolted structural Joints of the Engineering Foundation. Ribbed bolts will not be acceptable.

3.8.2 Bolt Holes

3.8.2.1 Regular Bolts

Holes for regular bolts shall be drilled or subdrilled and reamed. Holes shall be accurately located, smooth, perpendicular to the member, cylindrical and not more than 1/16-inch larger than the diameter of the bolt, unless shown otherwise.

3.8.2.2 Fitted Bolts

Holes for fitted bolts shall be match-reamed or drilled. Holes shall be smooth, perpendicular to the member and cylindrical. Burrs resulting from reaming shall be removed. The threads shall be entirely outside of the holes. The body diameter of the bolt shall have tolerances as recommended by ASME B4.1 for the class to fit specified. Fitted bolts shall be fitted in reamed holes by selective assembly to provide an LC 7 or closer tolerance fit.

3.8.2.3 High Strength Bolts

Holes for high strength bolts shall be accurately spaced, cylindrical and perpendicular to the member. The diameter of the hole shall be not more than 1/16-inch larger than the bolt diameter. If the thickness of the material is not greater than the diameter of the bolt, the holes may be punched. If the thickness of the material is greater than the diameter of the bolt, the holes will be either drilled full size or shall be subpunched or subdrilled at least 1/8-inch smaller than the diameter of the bolt and then reamed to full size. Poor matching of holes will be cause for rejection. Drifting done during assembly shall not distort the metal or enlarge the holes. For slight mismatching reaming to a larger diameter for the next standard size bolt will be allowed.

3.9 SET SCREWS

Set screws shall be of the socket type, with sockets of the hexagonal or multisplined shape. Set screws shall not be used for transmitting torsion. Set screws shall be installed using locktite.

3.10 SPECIAL NONDESTRUCTIVE TESTING

When doubt exist as to the soundness of any part, such part may be subjected to any form of nondestructive testing determined by the GQAR. This may include ultrasonic, magnaflux, dye penetrant, x-ray, gamma ray or any other test that will thoroughly investigate the part in question. The cost of such investigation will be borne by the Government only if the part is found not to be defective. Repair or replacement of defective parts and all retesting shall be at Contractor's expense. This is in addition to the nondestructive testing specified in paragraph: Government Quality Assurance Program (GQAP).

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 05 - METALS

SECTION 05502

METALS: MISCELLANEOUS, STANDARD ARTICLES, SHOP FABRICATED ITEMS

PART 1 GENERAL

- 1.1 GENERAL INFORMATION
- 1.2 REFERENCES
- 1.3 SUBMITTALS
- 1.4 Disposition Records
- 1.5 TEST OF MATERIALS
 - 1.5.1 General
 - 1.5.2 Test
 - 1.5.3 Specimens Samples
 - 1.5.4 Cost

PART 2 PRODUCTS

- 2.1 Materials
 - 2.1.1 STEEL CASTINGS
 - 2.1.1.1 General
 - 2.1.1.2 Castings Requiring Stress Relief
 - 2.1.2 IRON CASTINGS
 - 2.1.3 STRUCTURAL STEEL
 - 2.1.4 STEEL FORGINGS
 - 2.1.5 SHAFT STEEL
 - 2.1.6 BOLTS, SCREWS, AND WASHERS
 - 2.1.6.1 General
 - 2.1.6.2 Machine Bolts, Studs, Screws and Washers
 - 2.1.6.3 Structural Bolts
 - 2.1.7 FLOOR PLATES
 - 2.1.8 CARBON STEEL PIPE
- 2.2 OPERATOR'S CAB
 - 2.2.1 Design
 - 2.2.2 Cab Construction
 - 2.2.3 Operator's Chair
- 2.3 EXPANSION ANCHORS
- 2.4 WIRE ROPE

PART 3 EXECUTION

- 3.1 OPERATOR'S CAB
- 3.2 INSPECT RIVETS AND BOLTS
- 3.3 BRIDGE RAIL ALIGNMENT (Optional)

-- End of Section Table of Contents --

SECTION 05502

METALS: MISCELLANEOUS, STANDARD ARTICLES, SHOP FABRICATED ITEMS

PART 1 GENERAL

1.1 GENERAL INFORMATION

Fabrication requirements and workmanship provisions for items specified in this section shall also conform to the requirements of SECTION 05101.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B1.1	(2001) Unified Inch Screw Threads (UN and UNR Thread Form)
ASME B18.2.1	(1999) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(1999) Square and Hex Nuts (Inch Series)
ASME B18.3	(1998) Socket Cap, Shoulder and Set Screws (Inch Series) Including Dimensions of Hexagon and Spline Sockets and Keys to Match
ASME B18.6.2	(1998) Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws
ASME B18.6.3	(1998) Machine Screws and Machine Screw Nuts
ASME B18.22.1	(1998) Plain Washers
ASME B30.2	(2001) Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 27/A 27M	(2003) Steel Castings, Carbon, for General Application
ASTM A 36	(2002; Rev A) Structural Steel
ASTM A 48	(1998; Rev. A) Gray Iron Castings
ASTM A 53	(2002; Rev A) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

ASTM A 108	(1999) Steel Bars, Carbon, Cold-Finished, Standard Quality
ASTM A 148/A 148M	(2003; Rev B) Steel Castings, High-Strength, for Structural Purposes
ASTM A 307	(2002) Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A 325	(2004) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 576	(2000; Rev B) Steel Bars, Carbon, Hot-Wrought, Special Quality
ASTM A 588/A 588M	(2003; Rev A) High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4 in. (100 mm) Thick
ASTM A 668/A 668M	(2003) Steel Forgings, Carbon and Alloy, for General Industrial Use
ASTM A 786	(2000) Rolled Steel Floor Plates
ASTM A 808/A 808M	(2000; Rev A) High-Strength Low-Alloy Structural Manganese Vanadium Steel
ASTM E 1571	Electromagnetic Examination of Ferromagnetic Steel Wire Rope

CRANE MANUFACTURERS ASSOCIATION OF AMERICA (CMAA)

CMAA 70	(2000) Specifications for Electric Overhead Traveling Cranes
---------	--

CRANE MANUFACTURERS ASSOCIATION OF AMERICA (CMAA)

FEDERAL SPECIFICATIONS (FS)

FS RR-W-410	(1984) Wire Rope and Strand
FS FF-S-325	(1957) Shield, Expansion; Nail, Expansion; and Nail, Drive Screw

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Operator's cab; G, HDC

SD-03 Product Data

Materials; G, HDC

Lists of materials as specified herein and used for rehabilitation of the crane.

SD-06 Test Reports

Materials

Certified test reports for materials tests and analyses as specified herein.

SD-11 Closeout Submittals

Disposition Records

1.4 Disposition Records

Records which identify the disposition of all approved items specified in paragraph: Materials and fabricated items in the work as specified herein.

1.5 TEST OF MATERIALS

1.5.1 General

All materials, supplies, and parts and assemblies thereof entering into the work to be done under these specifications shall be tested, unless otherwise directed, in conformity with the Contract Clauses, and in accordance with the requirements of these specifications. In case the Contractor desires to use stock material not manufactured specifically for the work covered by these specifications, they shall submit evidence that such material conforms to the requirements of these specifications, in which case detailed test on these materials may be waived.

1.5.2 Test

All test or trials shall be made in accordance with SECTION 01451. Results of these test shall be submitted as soon as practicable after the test are made. The results shall be submitted in a form which provides a means of determining compliance with the specifications for the material tested.

1.5.3 Specimens Samples

Test specimens and samples for analysis shall be plainly marked to indicate the materials they represent and, if required, they shall be properly boxed and prepared for shipment.

1.5.4 Cost

All cost of all test and trials, excepting the pay and expense of the Government Inspector, shall be borne by the Contractor and shall be included in the contract price of these specifications.

PART 2 PRODUCTS

2.1 Materials

2.1.1 STEEL CASTINGS

2.1.1.1 General

Steel castings shall conform to ASTM A 27/A 27M OR ASTM A 148/A 148M grade as required, except that repairs to castings shall not be made without the knowledge and prior approval of the GQAR. Minor surface imperfections not affecting the strength of castings may be welded in the "green" if approved by the inspector. Surface imperfections shall be considered actual wall thickness, but in no case greater than 1-inch. Defects other than minor surface imperfections may be welded only when specifically authorized in accordance with the following requirements:

- a. The defects have been entirely removed and are judged not to affect the strength, use, or machinability of the castings, when properly welded and stress relieved.
- b. The proposed welding procedure, stress relieving and method of examination of the repair work have been submitted and approved.

2.1.1.2 Castings Requiring Stress Relief

Castings for parts carrying calculated stresses, parts subject to shock and other principal parts, including machine frame castings, gears, and heavy duty bearings stand shall be stress-relief annealed before being machined.

2.1.2 IRON CASTINGS

Iron castings shall conform to ASTM A 48, class as required.

2.1.3 STRUCTURAL STEEL

Structural steel shall conform to ASTM A 36, ASTM A 808/A 808M, or ASTM A 588/A 588M.

2.1.4 STEEL FORGINGS

Steel forgings shall conform to ASTM A 668/A 668M, class as required.

2.1.5 SHAFT STEEL

Steel for shafting shall conform to ASTM A 108, ASTM A 576 or applicable specifications of the Society of Automotive Engineers, Inc.

2.1.6 BOLTS, SCREWS, AND WASHERS

2.1.6.1 General

Material for fitted bolts shall conform to the applicable requirements of ASTM A 307. Washers shall conform to the applicable requirements in paragraph "Machine Bolts, Studs, Screws and Washers" f.

2.1.6.2 Machine Bolts, Studs, Screws and Washers

Machine bolts, studs, screws and washers furnished as an integral part of a

catalog item shall conform to the manufacturer's standard practice. Except where otherwise specified, machine bolts, studs, screws and washers shall conform to the applicable requirements of the following specifications:

- a. Threads. All bolts, studs, machine screws, nuts, and tapped holes shall be threaded in accordance with ASME B1.1.
- b. Bolts. Bolts shall be finished hex bolts conforming to ASME B18.2.1, SAE grade 2 or higher.
- c. Nuts. Nuts shall be hex conforming to ASME B18.2.2.
- d. Cap and Set Screws. Cap and set screws shall conform to the requirements of ASME B18.3 or ASME B18.6.2.
- e. Machine Screws and Nuts. Machine screws and nuts shall conform to the requirements of ASME B18.6.3.
- f. Washers. Plain washers shall conform to the requirements of ASME B18.22.1.

2.1.6.3 Structural Bolts

Structural bolts shall conform to the requirements of ASTM A 325 or ASTM A 307, Grade A.

2.1.7 FLOOR PLATES

Floor plates shall conform to the requirements of ASTM A 786 pattern to match existing plate.

2.1.8 CARBON STEEL PIPE

Carbon steel pipe shall conform to the requirement of ASTM A 53.

2.2 OPERATOR'S CAB

2.2.1 Design

Operator's cab shall be designed and constructed in accordance with CMAA 70 and ASME B30.2 and as shown. The cab shall be designed for a load of 50 lb/ft² of floor area, exclusive of the weight of any equipment attached to the cab. Cab shall be easily accessed by crane operator. Cab shall have space near cab entrance for storage of a hand fire extinguisher. An air conditioner sized for the new operator's cab shall be installed. Removable five-gallon condensate sump shall be included.

2.2.2 Cab Construction

Cab shall be replaced as shown, and designed to provide a clear view of the operating floor and hook for operator. The frame shall be constructed of structural steel shapes, the exterior unglazed portion of cab shall be covered with selected steel sheets not less than 1/8 in thick, the floor shall be made of reinforced steel plate. The interior unglazed portions of wall and doors shall be fabricated of reinforced steel sheets not less than 18 gage thick. Glazed portions of the cab shall be polished glass of the laminated safety type. Items of equipment shall be located so they will not obstruct vision through any window. Rubber mats with a minimum thickness of 1/8 inch shall be provided for the floor. The glazed portion

of the cab floor shall be polished clear polycarbonate plastic and shall be designed for a live load of not less than 500 lbs.

2.2.3 Operator's Chair

The operator's chair shall be of ergonomic design, with full body contoured cloth covered seats. The backrest, seat height, slope and fore and aft positions shall be independently adjustable. See SECTION 16050 for electrical requirements.

2.3 EXPANSION ANCHORS

Expansion anchors shall conform to FS FF-S-325, Group II, Type 4.

2.4 WIRE ROPE

All Wire rope shall be replaced. Wire rope shall conform to the applicable requirements of FS RR-W-410, Type 1, Class 2, 6 x 37, construction optional, improved or extra improved plow steel, preformed, regular lay, uncoated, independent wire rope core. The wire rope shall be the same size as existing wire rope. Wire rope shall come from a domestic wire rope manufacturer. After installation of new rope, but before load tests, all ropes shall be exercised by loading to 1/3 rated hoist capacity and running through entire range of hook travel six times. The Contractor shall provide a baseline NDT reading of the cable prior to the installation of the cable. Baseline NDT shall be in accordance with ASTM E 1571.

PART 3 EXECUTION

3.1 OPERATOR'S CAB

The existing operator's cab shall be replaced with a new cab as indicated. The existing operator's cab may contain asbestos panels (transite panels) that shall be disposed of in accordance with SECTION 02080.

3.2 INSPECT RIVETS AND BOLTS

The rivets and bolts on the bridge girders and equalizing beams shall be inspected for soundness. Loose rivets and bolts shall be identified visually by noting signs of movement between adjacent plates or by tapping with a steel hammer and noting the tone of the ringing sound emitted. Loose rivets and bolts shall be replaced with ASTM A 325 high strength bolts of the same size.

3.3 BRIDGE RAIL ALIGNMENT (Optional)

The gaps between the existing crane rail sections shall be adjusted so the tight joints are tight and the expansion joints have 1/16-inch to 1/8-inch gaps. The rail ends at the tight joints shall be squared up by grinding off the elongated metal that hangs over the top of the rail ends. This grinding shall allow the rail ends to butt together tightly, forming a tight joint (0 to 1/32 inch gap). The rail ends at the expansion joints shall also be squared up by grinding. Inspect rail clips and bolts. Tighten bolts to recommended torque. The rail span shall be inspected before and after the bridge rail repair and the rail span misalignment shall not be increased. If the allowable tolerance found in CMAA 70 is not met, the government shall be informed.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 09 - FINISHES

SECTION 09900

PAINTING

PART 1 GENERAL

- 1.1 GENERAL INFORMATION
- 1.2 REFERENCES
- 1.3 SUBMITTALS
 - 1.3.1 Airborne Sampling Results
- 1.4 WORK PERFORMANCE
- 1.5 LEAD PROTECTION PROGRAM
- 1.6 QUALIFICATIONS
 - 1.6.1 Certified Professional
 - 1.6.2 Certified Laboratory
- 1.7 SAFETY AND HEALTH PROVISIONS
 - 1.7.1 Abrasive Blasting
 - 1.7.1.1 Hoses and Nozzles
 - 1.7.1.2 Personal Protective Equipment for Abrasive Blasting Operators
 - 1.7.1.3 Workers Other Than Blasters
 - 1.7.2 Cleaning with Compressed Air
 - 1.7.3 Cleaning with Solvents
 - 1.7.3.1 Ventilation
 - 1.7.3.2 Personal Protective Equipment
 - 1.7.4 Pretreatment of Metals and Concrete with Acids
 - 1.7.4.1 Personal Protective Equipment
 - 1.7.4.2 Emergency Equipment
 - 1.7.5 Torch Cutting Painted Surfaces
 - 1.7.6 Paint Application
 - 1.7.6.1 Ventilation
 - 1.7.6.2 Explosion Proof Equipment
 - 1.7.6.3 Further Precautions
 - 1.7.6.4 Ignition Sources
 - 1.7.6.5 Respirators
 - 1.7.6.6 Protective Clothing and Equipment
- 1.8 MEDICAL STATUS
- 1.9 CHANGE IN MEDICAL STATUS
- 1.10 DEFINITIONS AND NOMENCLATURE
 - 1.10.1 Paint
 - 1.10.2 Shop Painting
 - 1.10.3 Field Painting
 - 1.10.4 Touch-up Painting
 - 1.10.5 Repainting
- 1.11 SAMPLING AND TESTING
 - 1.11.1 General
 - 1.11.2 Sampling
- 1.12 PACKAGING, LABELING, DELIVERY, AND STORAGE OF PAINTS

PART 2 PRODUCTS

- 2.1 PAINTS TO BE APPLIED - NUMBER OF COATS AND FORMULAS
- 2.2 LABELING, DELIVERY, AND STORAGE OF PAINTS

PART 3 EXECUTION

3.1 CLEANING AND PAINTING

3.1.1 Cleaning

3.1.2 Protection of Surfaces During Cleaning and Painting

3.1.3 Painting

3.2 DAMAGE PREVENTION

3.3 TOUCH-UP PAINTING

3.4 CONTRACTOR'S QUALITY CONTROL (CQC)

-- End of Section Table of Contents --

SECTION 09900

PAINTING

PART 1 GENERAL

1.1 GENERAL INFORMATION

The work covered by this section consists of furnishing all plant, labor, equipment, appliances, and materials; and in performing all operations in connection with preparation of surfaces and application of paint and other specified materials. The crane is painted with paint containing lead. The Contractor is responsible for all issues of worker safety and hygiene related to removal of lead based paint. Transportation and disposal requirements for waste generated during removal of the lead based paint are contained in SECTION 01355.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z87.1 (2003) Occupational and Educational Eye and Face Protection

ANSI Z358.1 (1998) Emergency Eyewash and Shower Equipment

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910.94 Ventilation

29 CFR 1910.146 Permit-required Confined Spaces

29 CFR 1910, Subpart I Personal Protective Equipment

29 CFR 1926.62 Lead

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3 (1982; R 2000) Power Tool Cleaning

SSPC SP 7 (2000) Joint Surface Preparation Standard Brush-Off Blast Cleaning

U. S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2003) U.S. Army Corps on Engineers Safety and Health Requirements Manual

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2002) National Electrical Code

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Batch Sampling

Notification to witness sampling of each batch of paint will require 48 hours, excluding weekends.

Qualifications; G, HDC

The Contractor shall provide certification pursuant to paragraph QUALIFICATIONS for all job sites. Submittal of the qualifications and experience of any additional qualified and competent persons the CIH, IH, or CSP employs to provide on-site safety and health will also be provided. Acceptance of this submission must be obtained prior to the submission of other required safety and health submittal items.

Airborne Sampling Results; G, HDC

Ventilation Assessment; G, HDC

The contractor shall develop a plan to provide ventilation assessment for all job sites.

Containment Plan; G, HDC

The Contractor shall develop a plan for containing all lead contaminated waste. This plan shall identify the containment areas and detail the methods and procedures to be used to contain emissions during abrasive blasting and any other lead-based paint removal activities. The contractor shall also identify the procedures for removing debris.

Water Quality Plan;G, HDC

The Contractor shall develop a plan to ensure that no lead is released into bodies of water or storm sewers. Therefore, NPDES permits per EPA regulation 40 CFR 122 are not required for the project. The plan shall include provisions for halting work if spills or emissions are observed entering into bodies of water or found in areas where storm water runoff could carry the debris into bodies of water or storm sewers. The plan shall also address cleanup and reporting procedures. In the event that there are any releases of lead paint debris into the waterways, with reportable quantities of hazardous substances designated pursuant to Section 311 of the Clean Water Act, they shall be reported to the EPA in accordance with 40 CFR 117 and 40 CFR 355. Releases or spills

that carry into waterways or storm sewers shall be thoroughly documented. The documentation shall include the time and location of the release, amount of material released, actions taken to clean up the debris, amount of debris recovered, and corrective action taken to avoid a reoccurrence. Releases shall also be reported to the Coast Guard and other state and local authorities as appropriate. If the release is equivalent to 10 pounds or more of lead-containing material in a 24-hour period, it is considered to be a reportable quantity under CERCLA. The Contractor shall comply with 40 CFR 302.

SD-06 Test Reports

System No. 16

Certified test reports for paints and thinners a minimum of 30 calendar days prior to their use.

1.3.1 Airborne Sampling Results

The contractor shall provide the name of the accredited laboratory, listed by the American Industrial Hygiene Association (AIHA), to be used to conduct the analysis of any collected air samples. In addition, the contractor shall provide the Contracting Officer with a copy of the test results from the laboratory within 5 working days of the sampling date and shall provide results from direct-reading instrumentation on the same day the samples are collected.

1.4 WORK PERFORMANCE

Work shall be performed in accordance with the requirements of 29 CFR 1910, 29 CFR 1926, EM 385-1-1, and other references as listed herein. Matters of interpretation of the standards shall be submitted to the Contracting Officer for resolution before starting work. Where the regulations conflict, the most stringent requirements shall apply.

1.5 LEAD PROTECTION PROGRAM

The Contractor shall develop a comprehensive lead protection program. The program shall include, but is not limited to the following:

- a. Containment Plan
- b. Water Quality Plan

Health and safety requirements for workers in accordance with 29 CFR 1926.62, including personal protective equipment, hygiene facilities, training, exposure assessment/personal air monitoring plan, and medical requirements, shall be incorporated into the Paint Removal and Painting Health and Safety Plan (see paragraph SAFETY AND HEALTH PROVISIONS of this section).

1.6 QUALIFICATIONS

Qualifications and experience shall comply with the following.

1.6.1 Certified Professional

The Contractor shall provide a person who is qualified and competent as defined in Section 01 of EM 385-1-1, will develop the required safety and health submittal, and will be responsible for on-site safety and health during the contract period. The person shall be a Certified Industrial Hygienist (CIH), an Industrial Hygienist (IH), or a Certified Safety Professional (CSP) with a minimum of 3 years of demonstrated experience in similar related work. The Contractor shall certify that the Certified Industrial Hygienist (CIH) holds current and valid certification from the American Board of Industrial Hygiene (ABIH), that the IH is considered board eligible by written confirmation from the ABIH, or that the CSP holds current and valid certification from the American Board of Certified Safety Professionals. The CIH, IH, or CSP may utilize other qualified and competent persons, as defined in EM 385-1-1, to conduct on-site safety and health activities as long as these persons have a minimum of 3 years of demonstrated experience in similar related work and are under the direct supervision of the CIH, IH, or CSP. For lead containing jobsites, the competent and qualified person shall have successfully completed an EPA or state accredited lead-based paint abatement Supervisor course specific to the work to be performed and shall possess current and valid state and/or local government certification, as required.

1.6.2 Certified Laboratory

The Contractor shall provide documentation which includes the name, address, and telephone number of the laboratories to be providing services. In addition, the documentation shall indicate that each laboratory is an EPA National Lead Laboratory Accreditation Program (NLLAP) accredited laboratory and that each is rated proficient in the NIOSH/EPA Environmental Lead Proficiency Analytical Testing Program (ELPAT) and will document the date of current accreditation. Certification shall include accreditation for heavy metal analysis, list of experience relevant to analysis of lead in air, and a Quality Assurance and Quality Control Program.

1.7 SAFETY AND HEALTH PROVISIONS

Paragraph SAFETY AND HEALTH PROVISIONS supplements the requirements of EM 385-1-1, paragraph (1). In any conflict between Section 01 of EM 385-1-1 and this paragraph, the provisions herein shall govern. EM 385-1-1 requires the preparation of an Accident Prevention Plan or APP (see also SECTION 02080, "ASBESTOS ABATEMENT"). The Accident Prevention Plan shall incorporate Activity Hazard Analyses and a Health and Safety Plan for Paint Removal and Painting as separate appendices into one site specific Accident Prevention Plan document. Any portions of the Contractor's overall Safety and Health Program that are referenced in the Accident Prevention Plan, e.g., respirator program, hazard communication program, confined space entry program, etc., shall be included as appendices to the Accident Prevention Plan.

1.7.1 Abrasive Blasting

The Contractor shall comply with the requirements in Section 06.H of EM 385-1-1.

1.7.1.1 Hoses and Nozzles

In addition to the requirements in Section 20 of EM 385-1-1, hoses and hose

connections of a type to prevent shock from static electricity shall be used. Hose lengths shall be joined together by approved couplings of a material and type designed to prevent erosion and weakening of the couplings. The couplings and nozzle attachments shall fit on the outside of the hose and shall be designed to prevent accidental disengagement.

1.7.1.2 Personal Protective Equipment for Abrasive Blasting Operators

Blasting operators shall be protected by MSHA/NIOSH approved abrasive blasting helmets with appropriate respiratory protection. Breathing air, source of supply and other respirator criteria shall conform to the requirements EM 385-1-1, section 05.E. These workers shall be provided with full-body coveralls and head coverings, heavy canvas or leather aprons or equivalent protection, work boots with non-skid soles, inner gloves, heavy leather or canvas outer gloves, eye protection and hearing protection.

1.7.1.3 Workers Other Than Blasters

Workers other than blasting operators working in close proximity to abrasive blasting operations shall be protected by utilizing MSHA/NIOSH-approved half-face or full-face air purifying respirators equipped with high-efficiency particulate air (HEPA) filters, eye protection meeting or exceeding ANSI Z87.1 and hearing protectors (ear plugs and/or ear muffs) providing at least 20 dBA reduction in noise level.

1.7.2 Cleaning with Compressed Air

Cleaning with high pressure compressed air after abrasive blasting operations shall be in accordance with Section 20.B.5 of EM 385-1-1 and personnel shall be protected by the same equipment required for abrasive blasters.

1.7.3 Cleaning with Solvents

1.7.3.1 Ventilation

Ventilation shall be provided where required by 29 CFR 1910.146 or where the concentration of solvent vapors exceeds 10 percent of the Lower Explosive Limit (LEL). Ventilation shall be in accordance with 29 CFR 1910.94, paragraph (c)(5).

1.7.3.2 Personal Protective Equipment

Personal protective equipment shall be provided where required by 29 CFR 1910.146 and in accordance with 29 CFR 1910, Subpart I.

1.7.4 Pretreatment of Metals and Concrete with Acids

1.7.4.1 Personal Protective Equipment

Personnel shall be protected in accordance with 29 CFR 1910, Subpart I.

1.7.4.2 Emergency Equipment

In addition to the requirements of Section 05 of EM 385-1-1, the contractor shall provide an eyewash in accordance with ANSI Z358.1, paragraph (6).

1.7.5 Torch Cutting Painted Surfaces

The Contractor shall comply with Section 10 of EM 385-1-1. If paint removal is not performed prior to torch cutting a painted surface, the employees shall be protected by approval of SCBA or SAR (air line) respirators. If the paint removal is performed prior to torch cutting, the surface to be cut shall be stripped of paint for a distance of at least 4 inches from the area of heat application. Employees stripping paint by scraping or sanding shall be protected by MSHA/NIOSH-approved half-face or full-face air purifying respirators equipped with high-efficiency particulate air (HEPA) filters.

1.7.6 Paint Application

1.7.6.1 Ventilation

When using solvent-based paint in confined spaces, ventilation shall be provided to exchange air in the space at a minimum rate of 5,000 cubic feet per minute per spray gun in operation. It may be necessary to install both a mechanical supply and exhaust ventilation system to effect adequate air changes within the confined space. All air-moving devices shall be located and affixed to an opening of the confined space in a manner that assures that the airflow is not restricted or short circuited and is supplied in the proper direction. Means of egress shall not be blocked. Ventilation shall be continued after completion of painting and through the drying phase of the operation. If the ventilation system fails or the concentration of volatiles exceeds 10 percent of the LEL (except in the zone immediately adjacent to the spray nozzle), painting shall be stopped and spaces evacuated until such time that adequate ventilation is provided.

An audible alarm that signals system failure shall be an integral part of the ventilation system. The effectiveness of the ventilation shall be checked by using ventilation smoke tubes and making frequent oxygen and combustible gas readings during painting operations. Exhaust ducts shall discharge clear of the working areas and away from possible sources of ignition. The Contractor shall submit a ventilation assessment for approval.

1.7.6.2 Explosion Proof Equipment

Electrical wiring, lights, and other equipment located in the paint spraying area shall be of the explosion proof type designed for operation in Class I, Division 1, Group D, hazardous locations as required by the NFPA 70. Electrical wiring, motors, and other equipment, outside of but within 20 feet of any spraying area, shall not spark and shall conform to the provisions for Class I, Division 2, Group D, hazardous locations. Electric motors used to drive exhaust fans shall not be placed inside spraying areas or ducts. Fan blades and portable air ducts shall be constructed of nonferrous materials. Motors and associated control equipment shall be properly maintained and grounded. The metallic parts of air-moving devices, spray guns, connecting tubing, and duct work shall be electrically bonded and the bonded assembly shall be grounded.

1.7.6.3 Further Precautions

- a. Workers shall wear nonsparking safety shoes.
- b. Solvent drums taken into the spraying area shall be placed on nonferrous surfaces and shall be grounded. Metallic bonding shall be maintained between containers and drums when materials are being

transferred.

c. Insulation on all power and lighting cables shall be inspected to ensure that the insulation is in excellent working condition and is free of all cracks and worn spots. Cables shall be further inspected to ensure that no connections are within 50 feet of the operation, that lines are not overloaded, and that they are suspended with sufficient slack to prevent undue stress or chafing.

1.7.6.4 Ignition Sources

Ignition sources, to include lighted cigarettes, cigars, pipes, matches, or cigarette lighters shall be prohibited in area of solvent cleaning, paint storage, paint mixing, or paint application.

1.7.6.5 Respirators

During all spray painting operations, spray painters shall use approved SCBA or SAR (air line) respirators, unless valid air sampling has demonstrated contaminant levels to be consistently within concentrations that are compatible with air-purifying respirator Assigned Protection Factor (APF). Persons with facial hair that interferes with the sealing surface of the facepiece to face seal or interferes with respirator valve function shall not be allowed to perform work requiring respiratory protection. Air-purifying chemical cartridge/canister half- or full-facepiece respirators that have a particulate prefilter and are suitable for the specific type(s) of gas/vapor and particulate contaminant(s) may be used for nonconfined space painting, mixing, and cleaning (using solvents). These respirators may be used provided the measured or anticipated concentration of the contaminant(s) in the breathing zone of the exposed worker does not exceed the APF for the respirator and the gas/vapor has good warning properties or the respirator assembly is equipped with a NIOSH-approved end of service life indicator for the gas(es)/vapor anticipated or encountered. Where paint contains toxic elements such as lead, cadmium, chromium, or other toxic particulates that may become airborne during painting in nonconfined spaces, air-purifying half- and full-facepiece respirators or powered air-purifying respirators equipped with appropriate gas vapor cartridges, in combination with a high-efficiency filter, or an appropriate canister incorporating a high-efficiency filter, shall be used.

1.7.6.6 Protective Clothing and Equipment

All workers shall wear safety shoes or boots, appropriate gloves to protect against the chemical to be encountered, and breathable, protective, full-body covering during spray-painting applications. Where necessary for emergencies, protective equipment such as life lines, body harnesses, or other means of personnel removal shall be used during confined-space work.

1.8 MEDICAL STATUS

Prior to the start of work and annually thereafter, all Contractor employees working with or around paint systems, thinners, blast media, those required to wear respiratory protective equipment, and those who will be exposed to high noise levels shall be medically evaluated for the particular type of exposure they may encounter. The evaluation shall include:

a. Audiometric testing and evaluation of employees who will work in

the noise environments.

b. Vision screening (employees who use full-facepiece respirators shall not wear contact lenses).

c. Medical evaluation shall include, but shall not be limited to, the following:

(1) Medical history including, but not limited to, alcohol use, with emphasis on liver, kidney, and pulmonary systems, and sensitivity to chemicals to be used on the job.

(2) General physical examination with emphasis on liver, kidney, and pulmonary system.

(3) Determination of the employee's physical and psychological ability to wear respiratory protective equipment and to perform job-related tasks.

(4) Determination of baseline values of biological indices for later comparison to changes associated with exposure to paint systems and thinners or blast media, which include: liver function tests to include SGOT, SGPT, GGPT, alkaline phosphates, bilirubin, complete urinalysis, EKG (employees over age 40), blood urea nitrogen (bun), serum creatinine, pulmonary function test, FVC, and FEV, chest x-ray (if medically indicated), blood lead (for individuals where it is known there will be an exposure to materials containing lead), other criteria that may be deemed necessary by the Contractor's physician, and Physician's statements for individual employees that medical status would permit specific task performance.

(5) For lead-based paint removal, the medical requirements of 29 CFR 1926.62 shall also be included.

1.9 CHANGE IN MEDICAL STATUS

Any employee whose medical status has changed negatively due to work related chemical and/or physical agent exposure while working with or around paint systems and thinners, blast media, or other chemicals shall be evaluated by a physician, and the Contractor shall obtain a physicians statement as described in paragraph MEDICAL STATUS prior to allowing the employee to return to those work tasks. The Contractor shall notify the Contracting Officer in writing of any negative changes in employee medical status and the results of the physicians reevaluation statement.

1.10 DEFINITIONS AND NOMENCLATURE

1.10.1 Paint

The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, and other coatings, organic or inorganic, whether they be used as prime, intermediate, or finish coats. This definition does not include troweled or sprayed-metal coatings.

1.10.2 Shop Painting

The term "shop painting" as referred to herein and/or on the drawings covers surface preparation and painting operations conducted in a shop,

mill, or plant, before shipment of paint-receiving items to the project site.

1.10.3 Field Painting

The term "field-painting" as referred to herein and/or on the drawings covers surface preparation and painting operations conducted at the project site.

1.10.4 Touch-up Painting

The term "touch-up painting" refers to the application of paint on small areas of painted surfaces to repair mars, scratches, and other defects where the coating has deteriorated in order to restore the coating to an unbroken condition.

1.10.5 Repainting

The term "repainting" designates the cleaning and recoating with the same or similar materials originally used on extensive areas on which the existing coatings have deteriorated or otherwise have not provided adequate protection.

1.11 SAMPLING AND TESTING

1.11.1 General

Batches of paint that the Contractor proposes to use shall be stored in an approved shelter on the project site or segregated at the source of supply sufficiently in advance of need to allow 45 days for sampling and testing. The Contractor shall notify the Contracting Officer when the paint is available for sampling. Batch sampling of each batch may be witnessed by the Government. Samples of paint submitted for approval shall be clearly labeled to indicate formula or specification number and nomenclature, batch number, batch quantity, color, date made, and applicable project contract number. Where specifically indicated herein or where indicated in a standards specification for a finished product, separate samples of ingredient materials shall be submitted. The ingredient samples shall be clearly identified by commercial name, trade designation, manufacturer, batch or lot number, and such other data as may be required. Testing of paint for compliance with the specifications will be performed in a Government designated laboratory at no expense to the Contractor except that the cost of testing any samples representing material that replaces previously rejected material will be deducted from payments to the Contractor at the rate of 300 dollars for each replacement sample.

1.11.2 Sampling

When the required amount of a material of a particular type or color is more than 50 gallons, the Contractor shall submit a one-quart sample of each batch he proposes to use. When the required quantity of any type is 50 gallons or less, he shall supply either of the following:

- a. A certified test report showing the results of required tests made on the material and a statement that it meets all of the specification requirements.
- b. A certified test report showing the results of required tests made on a previous batch of paint produced by the same firm using the same

ingredients and formulation except for minor differences necessitated by a color change and a statement that the previous batch met all of the specification requirements. A report of tests on the proposed batch showing the following properties applicable to the material specifications shall be submitted: color, gloss, drying time, opacity, viscosity, weight per gallon, and fineness of grind.

1.12 PACKAGING, LABELING, DELIVERY, AND STORAGE OF PAINTS

Paints shall be so processed and packaged as to ensure that within a period of one year from date of manufacture, they will not gel, liver or thicken deleteriously, or form gas in the closed container. Paints, unless otherwise specified or permitted, shall be packaged in standard containers not larger than five gallons in size, with removable friction or lug-type covers. Each container of paint or separately packaged component thereof shall be clearly and durably labeled to indicate the purchaser's order number, date of manufacture, manufacturer's batch number, quantity, color, component identification, and the designated name, formula or specification number of the paint together with special labeling instructions, when specified. Paint shall be delivered to the job in unbroken containers. Paints that can be harmed by exposure to cold weather shall be stored in ventilated, heated shelters. All paints shall be stored under cover from the elements and in locations free from sparks and flames.

PART 2 PRODUCTS

2.1 PAINTS TO BE APPLIED - NUMBER OF COATS AND FORMULAS

The following areas on the bridge crane shall be painted with System No. 16.

New material.

New equipment that does not have factory finish paint coat.

Areas on existing metal work and existing equipment where existing paint was disturbed/damaged during the course of the contract work.

Areas where existing equipment was removed, showing prime paint or paint of a different color.

New equipment with factory finish paint coating such as motors, reducers, cabinets, etc. and cable trays shall not be painted and shall be masked while painting surrounding areas.

New conduit (without existing painted conduit as part of the conduit run) shall not be painted.

New conduit (with existing painted conduit as part of the conduit run) and the existing conduit shall be painted.

Paint shall be brush or roller applied to match existing color and lustre. Spray painting at the project will not be permitted. Spray painting may be used at the contractor's facilities. The method of surface preparation shown in the tabulation of paint systems is for identification purposes only. Cleaning of surfaces prior to painting shall be accomplished in accordance with detailed requirements of paragraph: CLEANING AND PAINTING.

System No. 16

Surface Preparation	Paint Formulas to be Applied		
	1st Coat	2nd Coat	3rd Coat
Power tool or Brush-off Blast Cleaning	SSPC Paint 25 Type I	CID A-A-2962 Type I Class A Grade C	CID A-A-2962 Type I Class A Grade C

Surfaces shall be coated with the system indicated. The first coat shall be brush or roller applied at a spreading rate not to exceed 500 square feet per gallon and touched up as required to maintain its integrity at all times. The second and third coats of the system shall be brush or roller applied at a minimum spreading rate of 450 square feet per gallon.

2.2 LABELING, DELIVERY, AND STORAGE OF PAINTS

Each container of paint or separately packaged component thereof shall be clearly and durably labeled to indicate the purchaser's order number, date of manufacture, manufacturer's batch number, quantity, color, component identification, and the designated name and formula or specification number of the paint together with special labeling instructions. Paint shall be delivered in unbroken containers. Paints that can be harmed by exposure to cold weather shall be stored in ventilated, heated shelters. All paints shall be stored under cover from the elements and in locations free from sparks and flames.

PART 3 EXECUTION

3.1 CLEANING AND PAINTING

3.1.1 Cleaning

After fabrication, all structural steel and unfinished surfaces of castings shall be thoroughly cleaned of all loose mill or foundry scale, weld spatter and of all rust, dirt, oil, grease, and other foreign substances. Oil and grease shall be removed by wiping with suitable solvents. After solvent cleaning, the surfaces shall be cleaned by means of power tools conforming to the requirements of SSPC SP 3 or by dry blasting to the brush-off grade conforming to SSPC SP 7. Nonferrous metals, corrosion resisting steel and surfaces in sliding or rubbing contact shall not be painted. Ferrous machine-finished surfaces which do not require painting and surfaces in bolted contact shall be protected as specified in SECTION 05101, paragraph: PROTECTION OF MACHINED SURFACES. Machinery units shall be shop finished in accordance with the manufacturer's standard practice. Electrical equipment shall be touched-up or painted if required due to damage during the course of work or as otherwise determined necessary. Dry blasting is not permitted at the project.

3.1.2 Protection of Surfaces During Cleaning and Painting

Mask and protect items and materials such as machinery, name plates, identification labels, bearings, and shafting which would have their function and appearance degraded by paint to keep them free of paint.

Should any paint be applied to such items, immediately and carefully remove it. Carefully protect items and materials which would be damaged by abrasive blasting and other surface preparation techniques, not only from direct blasting damage, but also from grit and dust associated with the process. Care shall be taken to avoid contamination of adjoining spaces, machinery, and equipment. Any material or equipment damaged by gritblasting shall be repaired or replaced.

3.1.3 Painting

Paint shall be applied only on surfaces that are thoroughly dry. All joints and crevices shall be filled where necessary and thoroughly coated. The temperature of the surface to be painted and the atmosphere shall be maintained at or above 50 F. Materials painted under cover in damp or cool weather shall remain under cover until dry. Surfaces which do not require painting shall be masked or protected by other means during the painting of adjacent work. The material shall not be loaded for shipment until the paint is thoroughly dry. Painting materials shall not be laid on the ground. Care shall be used in handling painted material to avoid scraping or breaking the painted surfaces. Erection and field assembly marks shall be made on the painted surfaces. The finished coating shall be free from holidays, pinholes, bubbles, runs, drops, ridges, waves, laps, unnecessary brush marks, and variation in color, texture, and gloss. All paint coats shall be applied in such manner as to produce an even continuous film of uniform thickness.

3.2 DAMAGE PREVENTION

Welding on or in the vicinity of previously painted surfaces shall be conducted in a manner as to prevent weld spatter from striking the paint and to otherwise reduce coating damage to a minimum. Paint damaged by welding or other operations shall be restored to its original condition. The coating shall be completely cured prior to attaching slings or other handling devices.

3.3 TOUCH-UP PAINTING

Damage areas of the shop coatings due to handling, transporting, erection, or other causes shall be touch up painted in the field. All existing areas to be repaired shall be examined for the presence of lead based paint. If lead based paint is present, comply with the procedures in accordance with these specifications. Touch up painting shall conform with the same requirements as shop painting. Touch up painting shall be performed so that the paint finish and color matches surrounding surfaces or that the whole surface is repainted.

3.4 CONTRACTOR'S QUALITY CONTROL (CQC)

In conjunction with SECTION 01451 CQC for all operations shall include but not be limited to the following:

- a. Materials meet the specified requirements.
- b. Surfaces have been cleaned and prepared.
- c. Application of each type of material is as specified.
- d. Materials are stored as recommended by the paint manufacturer and as specified.

e. Surfaces receive the number of coats specified.

A copy of records and tests, as well as the records of corrective action taken, shall be furnished as herein before specified.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 14 - CONVEYING SYSTEMS

SECTION 14630

BRIDGE CRANE REHABILITATION

PART 1 GENERAL

- 1.1 GENERAL INFORMATION
- 1.2 REFERENCES
- 1.3 SUBMITTALS
 - 1.3.1 Crane Rating Computations
- 1.4 DATA, CAPACITIES, SPEEDS AND TRAVEL
 - 1.4.1 General
 - 1.4.2 Bridge Crane
 - 1.4.3 Main Hoist
 - 1.4.4 Auxiliary Hoist
- 1.5 WORK AREA

PART 2 PRODUCTS

- 2.1 FIRE EXTINGUISHER

PART 3 EXECUTION

- 3.1 QUALIFICATIONS
 - 3.1.1 General
 - 3.1.2 Qualified Crane Inspectors
 - 3.1.3 Qualified Craftsmen
 - 3.1.4 Qualified Crane Operators
- 3.2 REHABILITATION PROCEDURE
- 3.3 CLEANUP
- 3.4 PRE-REHABILITATION INSPECTION
- 3.5 REHABILITATION INSPECTION
- 3.6 POST-REHABILITATION INSPECTION AND PRELIMINARY NO-LOAD TEST
 - 3.6.1 Post-Rehabilitation Inspection
 - 3.6.2 Preliminary No-Load Test
- 3.7 ACCEPTANCE TESTS
 - 3.7.1 General
 - 3.7.2 Test Weights
 - 3.7.3 Test Sequence
 - 3.7.4 Hooks
 - 3.7.5 Equipment Monitoring
 - 3.7.6 No-Load Testing
 - 3.7.6.1 Hoist Operating and Limit Switch Test
 - 3.7.6.2 Trolley Travel
 - 3.7.6.3 Bridge Travel
 - 3.7.6.4 Hoist Loss of Power No-Load Test
 - 3.7.6.5 Travel Loss of Power No-Load Test
 - 3.7.6.6 No-Load Performance Tests
 - 3.7.7 Hoist Static Load Test
 - 3.7.8 Hoist Loss of Power Test
 - 3.7.9 Performance Tests
 - 3.7.10 Load Test
 - 3.7.11 Additional Test Requirements
- 3.8 OPERATION AND MAINTENANCE MANUALS

- 3.9 MANUFACTURER'S SERVICES
- 3.10 FIELD TRAINING
 - 3.10.1 General Operation and Maintenance
 - 3.10.2 Solid State Maintenance Training
- 3.11 TRANSPORTATION SERVICES, EQUIPMENT RENTAL, PARTS AND MATERIALS
(OPTIONAL)

-- End of Section Table of Contents --

SECTION 14630

BRIDGE CRANE REHABILITATION

PART 1 GENERAL

1.1 GENERAL INFORMATION

This section covers rehabilitation of the 500 ton bridge crane at Ice Harbor Power Plant. The bridge crane shall be recertified at full capacity. Detailed shop drawings shall be furnished showing assembly views and all details required to rehabilitate the crane. Metalwork fabrication shall be in accordance with the applicable requirements of SECTION 05101. Materials shall be in accordance with applicable paragraphs of SECTION 05502. Metal surfaces shall be painted in accordance with requirements of SECTION 09900. Mechanical work shall be in accordance with requirements of SECTION 15000. Electrical work shall be in accordance with requirements of SECTION 16050. Asbestos abatement work shall be in accordance with requirements of SECTION 02080.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B30.2	(2001) Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)
ASME B30.10	(1999) Hooks

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detailed shop drawings; G, HDC

SD-03 Product Data

Crane inspectors, craftsmen, and crane operators; G, HDC

Rehabilitation Procedure; G, HDC

Pre-Rehabilitation Inspection Procedure; G, HDC

Post-Rehabilitation Inspection Procedure; G, HDC

Preliminary No-Load Test Results; G, HDC

Acceptance Test Procedure; G, HDC

Test Weight Handling Procedures; G, HDC

Detailed Drawings of Test Weight Configuration; G, HDC

Crane Rerating Computations; G, HDC

1.3.1 Crane Rerating Computations

The Contractor shall submit engineering calculations incorporating the specifications for all new equipment and materials to be installed showing that the rehabilitated crane will be adequate for the rated capacity.

1.4 DATA, CAPACITIES, SPEEDS AND TRAVEL

1.4.1 General

Rated capacity of the main hoist is defined as the rated capacity of the hook. Rated capacity of the bridge crane is defined as the rated capacity of both main hoists. The rated capacity of the auxiliary hoist is defined as the rated capacity at the hook. Rated hoisting speed is defined as the speed when raising at rated capacity. Rated bridge travel speed is defined as the travel speed when traveling at rated capacity. Rated travel speed of the trolley is defined as the travel speed when operating at rated capacity. Data, capacities, travel distances, and rated speeds of the crane are as follows:

1.4.2 Bridge Crane

- a. Existing Rated Capacity, Tons (2,000 pounds).....500
- b. Existing Rated Capacity per trolley, Tons.....250
- c. Rated Travel Speed, Feet Per Minute.....100

1.4.3 Main Hoist

- a. Existing Rated Capacity, Tons.....250
- b. Rated Hoisting Speed, Feet Per Minute.....3.0
- d. Hook Travel:
 - Upper limit of travel not lower than Elevation.....409.50
 - Lower limit of travel not higher than Elevation.....309.50
- e. Bridge Span, Feet.....73'-0"
- f. Rated Trolley Travel Speed, Feet Per Minute.....30

1.4.4 Auxiliary Hoist

- a. Rated Capacity, Tons.....30
- b. Rated Hoisting Speed, Feet Per Minute.....30
- c. Upstream Hook Travel:
 - Upper limit of travel not lower than Elevation.....414.50
 - Lower limit of travel not higher than Elevation.....294.50
- d. Downstream Hook travel:
 - Upper limit of travel not lower than Elevation.....414.50
 - Lower limit of travel not higher than Elevation.....334.50

1.5 WORK AREA

The work area shall be the assembly bay.

PART 2 PRODUCTS

2.1 FIRE EXTINGUISHER

Five, ten-pound fire extinguishers shall be furnished. One will be installed in the operators cab, one on each of the trolleys, and one on each of the bridge walkways. The fire extinguishers shall have a minimum Underwriters Laboratory rating of 4A:60B:C and be of the stored pressure, dry chemical, rechargeable, portable type. They shall have a visual pressure gauge, hose, safety pin, squeeze handle and be wall mounted.

PART 3 EXECUTION

3.1 QUALIFICATIONS

3.1.1 General

Data showing that crane inspectors, craftsmen, and crane operators meet the following qualifications shall be submitted for approval:

3.1.2 Qualified Crane Inspectors

Crane inspectors shall possess the following:

- a. Have experience and knowledge in performing inspection on bridge cranes of similar size and capacity as the Ice Harbor bridge crane.
- b. Certifications showing they have attended crane inspection training seminars at established institutions.
- c. Are employed as crane inspectors for at least two years by a firm specializing in crane inspection work.

3.1.3 Qualified Craftsmen

Craftsmen shall possess the following:

- a. Have experience and knowledge in performing work on bridge cranes.
- b. Have performed work on bridge cranes for at least 5 years.
- c. Are employed for at least two years by a firm specializing in crane repair and rehabilitation work.

3.1.4 Qualified Crane Operators

Crane operators shall have experience and knowledge in operating bridge cranes of similar capacity as the Ice Harbor bridge crane. The crane operator shall meet the project personnel's satisfaction that the crane operator has the ability to operate the crane.

3.2 REHABILITATION PROCEDURE

A complete rehabilitation procedure for all work done on this job shall be submitted and approved before any work can start. The procedure shall include, but not be limited to the following:

- a. Step by step rehabilitation procedure
- b. Schedule of work
- c. Types of equipment used on site including work platforms, cranes, scissor lifts, etc.
- d. Methods of removing and reinstalling components
- e. Safety precautions

All components that can be fabricated and/or assembled prior to removing the crane from service shall be furnished prior to the commencement of on-site work.

3.3 CLEANUP

All components of the bridge crane shall be cleaned up during the rehabilitation of the crane and be completed prior to the post-rehabilitation inspection. All grease, oil, dirt, dust, debris, and any other foreign objects shall be cleaned up using appropriate cleanup methods. Cleanup methods include sweeping, vacuuming, wiping/washing using soap and water, solvents, etc. Additional cleanup requirements will be specified in other paragraphs. The crane corbels and crane rails shall be vacuumed and all grease shall be cleaned up.

3.4 PRE-REHABILITATION INSPECTION

Before any rehabilitation work is performed, an inspection shall be performed to determine if there are problems that require corrective action. A complete pre-rehabilitation inspection procedure shall be submitted and approved before any pre-rehabilitation inspection can start. All motions of the crane without load shall be tested as follows:

- a. The bridge shall travel the full length of the powerhouse.
- b. The trolleys shall travel the full length of the bridge.
- c. All hoists shall raise and lower blocks as far as possible.

Excessive skewing, misalignment, abnormal noises and vibrations, improper adjustment, overheating and any other possible defects shall be recorded and brought to the GQAR's attention. Inspection shall be in accordance with applicable standards including ASME B30.2, Overhead and Gantry Cranes and ASME B30.10, Hooks. Inspections shall meet or exceed the requirements of periodic inspection as stated in the standards. Records shall be kept of findings of inspections. The Government shall be notified of the date and time of the inspections. Any deficiencies found shall be brought to the attention of GQAR. Inspections shall be performed by qualified crane inspectors, although disassembling and reassembling may be performed by qualified craftsmen. The inspection shall be performed by qualified crane inspectors in the presence of the GQAR. An inspection report shall be submitted.

3.5 REHABILITATION INSPECTION

All crane components, including the following, shall be inspected for wear, distortion, deformation, cracks, nicks, corrosion, and any possible defect:

- Wire ropes
- Reducers
- Drums
- Bearing stands and housings
- Bearings
- Drum gears and pinions
- Sheaves
- Couplings
- Structural frame
- Wheel truck assemblies
- Shafting
- Bumpers
- Lifting beam
- Hooks
- Bridge and Trolley rails including fasteners.

Inspection shall be in accordance with applicable standards including ASME B30.2, Overhead and Gantry Cranes and ASME B30.10, Hooks. Inspections shall meet or exceed the requirements of periodic inspection as stated in the standards. Records shall be kept of findings of inspections. Any deficiencies found shall be brought to the attention of the Government. Qualified crane inspectors shall perform inspections, although qualified craftsmen shall perform disassembling and reassembling, if required. Disassembly for inspection is required if it is specifically stated in the specifications or on the drawings. Inspections include disassembly of components, if required, and thorough cleaning of the components for optimum inspecting. After inspection and correcting any deficiencies, components shall be reassembled, adjusted, lubricated, and made ready for service.

3.6 POST-REHABILITATION INSPECTION AND PRELIMINARY NO-LOAD TEST

3.6.1 Post-Rehabilitation Inspection

All rehabilitation work including adjustments, lubrication and clean-up shall be completed prior to performing post-rehabilitation inspection. Painting may be performed after testing. A complete post-rehabilitation inspection procedure shall be submitted and approved before any post-rehabilitation inspection can start. Post-rehabilitation inspection

shall be performed by qualified crane inspectors and findings recorded. After the crane has been completely reassembled, adjusted, lubricated, and otherwise made ready for operation, it will be subjected to the following inspections and tests:

- a. Inspection in accordance with ASME B30.2, Overhead and Gantry Cranes (periodic inspection).
- b. The bridge, trolley, and each hoist will be operated in each direction of travel for the full travel distance without load. The equipment will be examined for misalignment, excessive skewing, improper adjustment, abnormal noises, overheating and other possible defects.
- c. Limit switches will be checked for accuracy of settings.
- d. All incidental equipment including load cells, cable carriers, lights, and brakes will be checked for proper operation.
- e. Readings (voltage, current, frequency, and motor speed) shall be recorded for each speed point for hoist and travel motion. Readings shall be checked with specification requirements.

If defects, such as misalignment, skewing, improper adjustment, abnormal noises, overheating, or other defects become apparent, the inspection shall be discontinued until proper action has been taken to correct the conditions. After corrective action has been taken, the inspection shall be continued or rerun as directed. The inspection shall be performed by qualified crane inspectors in the presence of the GQAR. A test report shall be submitted.

3.6.2 Preliminary No-Load Test

After successfully passing the post-rehabilitation inspection, the preliminary no-load test shall be performed.

The No-Load test and performance test at no-load shall be performed prior to the acceptance testing. Test all functions of the crane and make all adjustments as required. See paragraphs "Equipment Monitoring, "No-Load Testing" "Performance Tests", and "Additional Test Requirements". Tests results shall be submitted for approval. The government will not attend the acceptance testing until the following have been completed:

- a. Rehabilitaion Work
- b. Adjustments And Lubrication
- c. Clean-Up
- d. Post-Rehabilitation Inspection
- e. Successful Preliminary No-Load Test
- f. Submittal Of Preliminary No-Load Test Results

3.7 ACCEPTANCE TESTS

3.7.1 General

After successfully passing the preliminary no-load testing and the test results have been accepted, the acceptance tests shall be performed. No testing shall be performed without an approved acceptance test procedure and approved preliminary no-load test results. Specified tests shall be repeated for each individual trolley, hoist and hook. Provide all personnel and equipment necessary to conduct the tests including but not limited to crane operators, riggers, data recorders (personnel), rigging gear, test weights, and measuring instruments. Testing, including repeating the no-load testing, shall be performed in the presence of the Government. Notify the Government, at least 20 days in advance, the date of the acceptance test. Acceptance testing shall begin on a Tuesday, if Monday is not a Federal Holiday, otherwise it shall start on a Wednesday. The acceptance test shall be performed at the Erection Bay.

3.7.2 Test Weights

The type of test weights used by the Contractor in the tests shall be submitted for approval. Detailed test weight handling procedures and detailed drawings of test weight configuration (to scale) showing test weight configuration with the crane, powerhouse, generator, and other features shown on the drawings shall be submitted. If water bags are used, provide means of pumping water into the water bags and means of draining the bags. Test loads shall be plus 5 percent, minus 0 percent. Load on the Erection Bay floor shall not exceed 1,000 lbs. per sq. foot.

3.7.3 Test Sequence

The crane shall be tested according to the applicable paragraphs of this procedure in the sequence provided.

3.7.4 Hooks

Hooks shall be measured for hook throat spread before and after load test. A throat dimension base measurement shall be established by installing two tram points and measuring the distance between these tram points (to within 1/64 inch). This base dimension shall be recorded. The distance between tram points shall be measured before and after the load test.

3.7.5 Equipment Monitoring

During the acceptance test, improper operation or poor condition of safety devices, electrical components, mechanical equipment, and structural assemblies shall be monitored. Observed defects critical to continued testing shall be reported immediately to the GQAR and testing shall be suspended until the deficiency is corrected. During and immediately following the acceptance test, the following inspections shall be made:

- a. Inspect for evidence of bending, warping, permanent deformation, cracking or malfunction of structural components.
- b. Inspect for evidence of slippage in wire rope sockets and fittings.
- c. Check for overheating in brake operation; check for proper stopping. All safety devices, including emergency stop switches and POWER OFF pushbuttons, shall be tested and inspected separately to verify proper

operation of the brakes.

d. Check for abnormal noise or vibration and overheating in machinery drive components.

e. Check wire rope sheaves and drum spooling for proper operation, freedom of movement, abnormal noise or vibration.

f. Check electrical drive components for proper operation, freedom from chatter, noise or overheating.

g. Inspect external gears for abnormal wear patterns, damage, or inadequate lubrication.

3.7.6 No-Load Testing

3.7.6.1 Hoist Operating and Limit Switch Test

The load hook shall be raised and lowered through the full range of normal travel at rated speed and other speeds of the crane. The load hook shall be stopped below the limit switch upper setting. In slow speed only, proper operation of upper and lower limit switches shall be verified. Brake action shall be tested in each direction. The proper time delay shall be verified between the actuation of the dual brakes.

3.7.6.2 Trolley Travel

The trolley shall be operated the full distance of the rails exercising all drive speed controls in each direction. Brake operation shall be verified in each direction. In slow speed the trolley bumpers shall contact the trolley stops located on the girders.

3.7.6.3 Bridge Travel

The bridge shall be operated the full distance of the runway exercising all drive speed controls, in each direction. Brake operation shall be verified in each direction. In slow speed, the crane bridge bumpers shall contact the runway rail stops.

3.7.6.4 Hoist Loss of Power No-Load Test

While slowly lowering the hook, the main power source shall be disconnected verifying that the hook will not lower and that the brake will set. The test shall be repeated for the hoist reduced speed drive controls.

3.7.6.5 Travel Loss of Power No-Load Test

With the hook raised to clear obstructions and the bridge and trolleys traveling in slow speed, the main power source shall be disconnected verifying that the bridge and trolley, will stop and that the brakes will set. The test shall be repeated for the bridge and trolley reduced speed drive controls.

3.7.6.6 No-Load Performance Tests

During the no-load test, a full set of readings shall be taken from the displays on the drive controllers and recorded for each speed point for hoist and travel motion. Readings shall include voltage, current, frequency, and speed of each motor. Two sets of readings shall be taken,

one for normal speeds and one for reduced speeds. Hoist and travel speeds shall be computed based on motor speed and plotted against load for all speed points. The test conditions are as follows:

- a. Main Hoists: Each main hoist shall be tested at all five speed points both raising and lowering.
- b. Auxiliary Hoist: Each auxiliary hoist shall be tested at all five speed points both raising and lowering.
- c. Bridge Travel: The bridge travel shall be tested at all five speed points in both directions of travel at no-load.
- d. Trolley Travel: Each trolley travel shall be tested at all five speed points in both directions of travel at no-load.

3.7.7 Hoist Static Load Test

Holding brakes and hoisting components shall be tested by manually releasing one of the holding brakes. The first holding brake shall be reapplied and the second holding brake released. Any lowering that may occur indicates a malfunction of the brakes or lowering components. The test load shall be 100% of the hoist capacity.

3.7.8 Hoist Loss of Power Test

After raising the test load to a sufficient height, slowly lowering the test load, the emergency stop pushbutton shall be pressed verifying that the test load will not lower and that both brakes will set. The test load shall be 100% of the hoist capacity.

3.7.9 Performance Tests

During the test for each condition specified, a full set of readings shall be taken from the displays on the drive controllers and recorded for each speed point for hoist and travel motion. Readings shall include voltage, current, frequency, and speed of each motor. Two sets of readings shall be taken, one for normal speeds and one for reduced speeds. Hoist and travel speeds shall be computed based on motor speed and plotted against load for all speed points. Positioning accuracy shall be determined by measuring the rotation of the hoist drums and travel distances. The test conditions are as follows:

- a. Main Hoists: Each main hoist shall be tested at all five speed points both raising and lowering. The test shall be run at 250 tons.
- b. Auxiliary Hoists: Each auxiliary hoist shall be tested at all five speed points both raising and lowering. The test shall be run at 30 tons.
- c. Bridge Travel: Each bridge travel shall be tested at the first 2 speed points in both directions of travel at 500 tons.
- d. Trolley Travel: Each trolley travel shall be tested at the first 2 speed points in both directions of travel at 250 tons. Trolley travel shall be at least 10 feet each way.

After these tests, all motors, brakes, gearing, and other mechanical or electrical equipment shall be thoroughly examined to assure no damage has

occurred.

3.7.10 Load Test

Unless otherwise indicated, the following tests shall be performed using a test load of 125 percent of rated load.

a. Dynamic Load Test: The test load shall be raised and lowered at least two feet, operating at the lowest speed point. The machinery shall be completely stopped at least once in each direction to ensure proper brake operation.

b. Trolley Dynamic Load Test: While operating the trolley with the load on the hook, the proper functioning of the lowest speed point and proper brake action shall be verified. Trolley travel shall be at least ten feet.

c. Bridge Dynamic Load Test: While operating the bridge with the load on the hooks, the proper functioning of the lowest speed point and brake action shall be verified. Bridge travel shall be at least twenty feet.

3.7.11 Additional Test Requirements

Tests shall be made by and at the expense of the Contractor and witnessed by the GQAR. If defects, such as misalignment, improper adjustment, overheating, or other defects, become apparent which tend to damage the crane, or nullify the test results, the tests shall be discontinued until proper action has been taken to correct the conditions. After corrective action has been taken, the tests shall be continued or rerun as directed.

3.8 OPERATION AND MAINTENANCE MANUALS

Operation and maintenance (O&M) manuals shall be furnished in accordance with Section 01330. Condensed O&M instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the crane shall be prepared in typed form, bound in a binder, and placed in the operator's cab.

3.9 MANUFACTURER'S SERVICES

Services of a manufacturer's representative who is experienced in the installation, adjustment, erection and operation of the equipment specified shall be provided. The representative shall supervise the installation, adjustment, and testing of the equipment.

3.10 FIELD TRAINING

3.10.1 General Operation and Maintenance

A field training course shall be provided for designated operating staff members. Training shall be provided for a total period of 4 hours of normal working time and shall start after the crane has passed the final acceptance test. Field training shall cover all of the items contained in the operating and maintenance instructions. The Contracting Officer shall be given at least 2 weeks advance notice of such training.

3.10.2 Solid State Maintenance Training

The Contractor shall have the electrical control equipment supplier provide a 4 hour training session on the equipment. The training shall take place at the project site and shall include both lecture and hands on type of work. Instructor shall demonstrate how to diagnose various types of equipment failure.

3.11 TRANSPORTATION SERVICES, EQUIPMENT RENTAL, PARTS AND MATERIALS (OPTIONAL)

Repairs which are specifically directed in writing and not covered elsewhere in the specifications may require parts and materials which can only be determined after disassembly and inspection. Examples are fasteners, material for special fasteners, bronze bushings, materials for replacement components, standard ball bearings, etc. Repairs may also require equipment rental including items as machine tool time. Repairs may also require the transportation of items to a repair facility. Labor required for incorporation of additional directed items may be performed using Services of Skilled Craftsmen as specified in Section 15995.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 15 - MECHANICAL

SECTION 15000

MECHANICAL

PART 1 GENERAL

- 1.1 GENERAL INFORMATION
- 1.2 REFERENCES
- 1.3 SUBMITTALS
- 1.4 Dimensioned Outline Drawings
- 1.5 Data for Bridge Crane Components.
 - 1.5.1 Computations

PART 2 PRODUCTS

- 2.1 SHAFT COUPLING
 - 2.1.1 Flexible Couplings
 - 2.1.2 Rigid Couplings
- 2.2 GEARS AND SPEED REDUCERS
 - 2.2.1 General
 - 2.2.2 Gears
 - 2.2.3 Speed Reducers
- 2.3 GEAR CASES
 - 2.3.1 General
 - 2.3.2 Wheel Gear Cases
- 2.4 BEARINGS
 - 2.4.1 General
 - 2.4.2 Sleeve-Type
 - 2.4.2.1 Anti-friction
- 2.5 SHAFTING
 - 2.5.1 General
 - 2.5.2 Support
- 2.6 KEYS AND KEYSEATS
- 2.7 PINS
- 2.8 LUBRICATION
- 2.9 GUARDS, COVERS, AND DRIP PANS
- 2.10 MACHINERY EFFICIENCIES

PART 3 EXECUTION

- 3.1 MAIN HOISTS
 - 3.1.1 General
 - 3.1.2 Main Hoist Pinions and Bull Gears
 - 3.1.3 Main Hoist Gear Reducers
 - 3.1.4 Mounting Bases
 - 3.1.5 Miscellaneous Items
- 3.2 AUXILIARY HOISTS
 - 3.2.1 General
 - 3.2.2 Auxiliary Hoist Pinions and Bull Gears
 - 3.2.3 Auxiliary Hoist Gear Reducers
 - 3.2.4 Mounting Bases
 - 3.2.5 Miscellaneous Items

- 3.3 TROLLEY DRIVES
 - 3.3.1 General
 - 3.3.2 Reducers
 - 3.3.3 Mounting Bases
 - 3.3.4 Miscellaneous Items
 - 3.3.5 Wheel Truck Assembly
 - 3.3.6 Couplings
- 3.4 BRIDGE DRIVE
 - 3.4.1 General
 - 3.4.2 Reducers
 - 3.4.3 Mounting Bases
 - 3.4.4 Miscellaneous Items
 - 3.4.5 Couplings
- 3.5 HOOK SAFETY LATCHES
- 3.6 BUMPER SAFETY CABLES
- 3.7 FURNISH NEW BRIDGE TRUCK (OPTIONAL)
- 3.8 BRIDGE TRUCKS (OPTIONAL).
 - 3.8.1 Removal and Reinstallation
 - 3.8.2 Refurbishment

-- End of Section Table of Contents --

SECTION 15000

MECHANICAL

PART 1 GENERAL

1.1 GENERAL INFORMATION

This section covers the mechanical work for the rehabilitation of the 500 ton bridge crane at Ice Harbor Project. The Contractor shall engineer and design all new components of the system and submit computations and drawings as stated in the SUBMITTALS paragraph below. The design engineer for all computations and drawings shall be a registered professional engineer. Detailed shop drawings shall be furnished showing all details required to install mechanical equipment. See SECTION 14630 for inspection and cleaning requirements. See SECTION 05502 for miscellaneous, standard articles, shop fabricated items.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent indicated by the reference. The publications are referred to in the text by basic definition only.

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)

ABMA 8.2	(1999) Ball and Roller Bearing Mounting Accessories, Inch Design
ABMA 19.1	(1987; R 1999) Tapered Roller Bearings - Radial Metric Design
ABMA 19.2	T(1994; R 1999)apered Roller Bearings - Radial Inch Design
ABMA 20	Radial Bearings of Ball, Cylindrical Roller and Spherical Roller Types Metric Design

AMERICAN GEAR MANUFACTURERS ASSOCIATION (AGMA)

AGMA 6010	(1997; Rev. F) Standard for Spur, Helical, Herringbone, and Bevel Enclosed Drives
AGMA 2001	(1995; Rev. C) Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth

ASME INTERNATIONAL (ASME)

ASME B15.1	(2000) Safety Standard for Mechanical Power Transmission Apparatus
ASME B30.10	(1999) Hooks
ASME B17.1	(1967; R 2003) Keys and Keyseats

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 22 (1995) Bronze Castings for Bridges and Turntables

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Dimensioned Outline Drawings; G, HDC

SD-03 Product Data

Data for Bridge Crane Components; G, HDC

Computations; G, HDC

1.4 Dimensioned Outline Drawings

Dimensioned outline drawings for each hoist machinery, trolley drive machinery, and bridge drive machinery. Detail drawings showing all details required for a complete installation of hoist machinery, trolley drive machinery, and bridge drive machinery.

1.5 Data for Bridge Crane Components.

Complete descriptive data, catalog cuts, detailed drawings, parts list, and other data for all components furnished shall be submitted.

1.5.1 Computations

Computations for mechanical components shall be submitted.

PART 2 PRODUCTS

2.1 SHAFT COUPLING

2.1.1 Flexible Couplings

Flexible couplings shall be capable of developing the full strength of the shafting which they connect and shall be pressed and keyed thereon. In determining the coupling capacity, the manufacturer's published rating shall be divided by a service factor of 1.5 or factor recommended by manufacturer whichever is greater. Couplings shall be forged steel and shall transmit torque by means of external gears on hubs engaging in internal gears on the coupling sleeves. Sleeves shall be fastened so that they cannot work or slip off. Couplings with sleeves held in place or retained by snap rings will not be permitted. Couplings shall be enclosed and sealed to retain the lubricant and shall be oil tight under both static and operating conditions. A flexible coupling shall be provided at each motor. Motor and reducer shafts shall extend all the way

through the coupling halves. Brake wheels shall not be used in lieu of couplings.

2.1.2 Rigid Couplings

Rigid couplings shall be made of cast or forged steel and shall be of the flanged or compression type with recessed bolts. Couplings shall be capable of developing the full strength of the shafting which they connect and shall be keyed to the shafting. Rigid plate guards shall be provided for all couplings. Motor and reducer shafts shall extend all the way through the coupling halves. Brake wheels shall not be used in lieu of couplings.

2.2 GEARS AND SPEED REDUCERS

2.2.1 General

Speed reducers shall be in accordance with AGMA 6010. Gears for final reductions shall be of the spur or helical type in accordance with AGMA 2001.

2.2.2 Gears

The reducer assemblies shall be rated in accordance with AGMA 6010. The unit rating shall be equal to or exceed the maximum input power times an application factor. The application factor shall be 1.50. In calculating the durability rating of gears, a value of not less than 1.0 shall be used for the overload factor, size factor, surface condition factor, factor of safety and temperature factor, and a value of 1.0 shall be used for the life factor. The durability rating of gears shall be based on not less than 0.8 of the tangential load produced at rated horsepower output of the motor. In calculating the strength rating of gears, a value of not less than 1.0 shall be used for the overload factor, size factor, surface condition factor, factor of safety (fatigue strength) and temperature factor, and a value of 1.0 shall be used for the life factor. A value of 70 percent of the allowable bending design stress shall be used for gears for the trolley and bridge drives and other gears which are subject to reverse loading. In addition, the gears shall be designed such that the bending stress produced by the rated torque (factory adjusted torque setting) of the brakes will not exceed 50 percent of the yield point of the material. Also, the gears shall be designed such that the bending stress produced by the maximum torque of the motor will not exceed 75 percent of the yield point of the material. The material yield points used shall be the allowable yield strength of the materials given in AGMA 2001 and AGMA 6010, except that for surface hardened gears the yield point shall be that of the base material. Gears shall be cut from solid metal to tolerances equal to or better than AGMA Quality Number 6 overhung gears or pinions will not be permitted except for spiral bevel pinions in speed reducers. Pinions shall be forged integral with the shaft where practicable. Gears shall be pressed or shrunk on the shaft and provided with standard rectangular keys. Gears may be cast steel, steel welded and annealed, or forged steel. Welding of defective gear teeth will not be permitted.

2.2.3 Speed Reducers

Speed reducers shall be of the right angle bevel - helical gear type or parallel shaft type entirely self contained in an oil tight, steel or cast-iron housing designed to maintain shafts and bearings in accurate alignment. The pitch line velocity of spur gears shall not exceed 760 feet

per minute at rated load and speed. Speed reducers shall be a standard catalog product of a speed reducer manufacture with special shafts to suit.

The rating of standard speed reducers shall be based on the catalog rating of the speed reducer. Catalog rated speed reducers shall have a service factor of not less than 1.5. Rating of the speed reducer shall be based on the rated horsepower output of the motor or on the full load torque of the motor, depending on the operating speed, taking into account the friction losses in the machinery connecting the motor to the respective speed reducer. In addition, the speed reducer shall be sized such that the rated torque (factory torque setting) of the brake will not exceed the catalog torque rating of the speed reducer. Unless otherwise approved, housing shall be in accordance with the provisions of paragraph "Gear Cases." Bearings shall be of anti-friction type. Provisions shall be made for adequate lubrication of all gears and bearings throughout the range of operating speeds. Vertical reducers shall be provided with positive displacement oil pump to lubricate the upper gears and bearings. The pump shall be mounted external to the reducer and shall have pressure gage discharge side. Each reducer shall be provided with a permanently attached nameplate containing the following information: The name of the manufacturer, the reduction ratio, the rated capacity, speed, the service rating or service class. All speed reducers shall be held securely in place by one of the following methods:

- a. Fitted bolts installed with plain washers and double nuts.
- b. Machine bolts and dowels. The dowels shall be of such size as to adequately locate the device and resist the total shearing forces.

The bolts shall be installed with nuts and lockwashers. Shear bars will not be allowed.

2.3 GEAR CASES

2.3.1 General

Except as specified in paragraph "Wheel Gear Cases," all gears shall be enclosed in oil tight cases. The cases shall be provided with felt seals or other material if approved, drain plugs, breathers, oil level dip stick or sight glass, lifting lugs, and an oil tight inspection cover which can be removed for inspection of the gears. Gear cases shall be provided with means of cleaning and draining without dismantling the equipment. Drain plugs shall be accessible and where necessary shall be piped to convenient locations. Valves shall be installed at drain ports and drain plugs installed after the valves. Gear cases shall be made of cast iron, cast steel, or of steel plate of welded construction and shall be designed to be sufficiently rigid to maintain proper alignment of the gearing under all load conditions.

2.3.2 Wheel Gear Cases

Cases for gears at the bridge wheels shall be so constructed as to prevent lubricants from dripping on the runway. The gear cases shall be designed to provide easy access to the gears for inspection and lubrication.

2.4 BEARINGS

2.4.1 General

Except where otherwise specified, bearings may be of the roller, ball, or

sleeve type. Bearings shall be so designed as to be easily replaceable and shall be placed as close as possible to the points of loading. Where feasible, bearing bases for gear trains shall be made in one piece to ensure that alignment and spacing will be maintained. Where welded construction is employed for bearing housing assemblies or pedestals, the weldments shall be stress relieved. Bearing fits shall be as recommended by the manufacturer for the application. Bearing bases and pillow blocks shall have solid bases and shall be held securely in place by one of the following methods:

- a. Fitted bolts installed with plain washers and double nuts.
- b. Machine bolts and dowels. The dowels shall be of such size as to adequately locate the device and resist the total shearing forces.

The bolts shall be installed with nuts and lockwashers. Shear bars will not be allowed. Pillow blocks with hollow bases will not be allowed.

2.4.2 Sleeve-Type

Sleeve-type bearings shall have removable bronze linings flanged at the ends where required for thrust or axial alignment and shall conform to ASTM B 22, Alloy C, or SAE Alloy Nos. 64 or 660. Unless otherwise specified herein, bearings on revolving shafts shall be of the divided type, designed so that each shaft may be removed from the crane with its pinions and gears in position. Provision shall be made for holding linings effectively against rotation or changing of position under load. Linings, thrust washers, and bushings shall be grooved, if necessary, for satisfactory distribution of the lubricant. The edges of the grooves shall be rounded and the ends of the grooves shall be not less than 1/8 inch from the ends of the bearing. The bearing pressure of bronze lining shall be limited to a maximum value to 1,300 psi, and in addition, the area of the bearing shall be such that the product of the bearing pressure in psi and the square root of the rubbing velocity in feet per second shall not exceed 900. The thickness of bronze linings shall not be less than given in the following tabulation:

SHAFT DIAMETER (inches)	LINING THICKNESS (inches)
Less than (2-1/2)	1/8
2-1/2 TO 4	1/4
4 TO 5-1/2	3/8
5-1/2 TO 7	1/2
7 TO 8	5/8

2.4.2.1 Anti-friction

Anti-friction bearings shall be of standard types most suitable for the respective application and shall have both inner and outer races. Ball and roller bearings shall conform to the applicable requirements of the ABMA 19.1, ABMA 19.2 and ABMA 20. The manufacturer's published ratings shall be used in determining the bearing capacity. Fixed bearings shall be secured against a shaft shoulder by means of a locknut and bearing lockwasher as described in ABMA 8.2. Floating bearings shall be secured against a shaft shoulder by means of a retaining ring or locknut and lockwasher, except that floating bearings at intermediate points on long shafts may be secured

with a tapered sleeve and locknut and lockwasher. Bearings, except as noted below, shall have a L-10 life of 5,000 hours and shall be designed for the loads and speeds resulting from the crane performance specified in SECTION 14630. For wheel bearings, one bearing on each wheel axle shall be of the fixed double-thrust type. The other bearing shall be arranged to allow for expansion or float of the axle. On other bearings where thrust occurs, unless the design is such that the thrust on a bearing can be determined, the full thrust load shall be added to each bearing on the shaft or axle. Bearings shall have oil tight enclosures and, except for sheave bearings, shall have double lipped seals; a synthetic rubber spring loaded element to retain the grease and another synthetic rubber element to exclude foreign matter.

2.5 SHAFTING

2.5.1 General

Shafting except for those in speed reducers which are a standard catalog item shall be designed to provide factors of safety not less than 5 with loads increased by the applicable shock factors. A combined shock and fatigue factor of 1.25 shall be used for hoist or other non-reversing loads and 1.75 for trolley drives, gantry drives, or similar reversing loads. Shafting in speed reducers which are standard catalog items shall conform to the requirements of paragraph "Gears and Speed Reducers."

2.5.2 Support

Shafting shall be amply supported and provided with adequate means to prevent longitudinal movement. The distance between bearings on shafting subject to bending, except that due to its own weight, shall be such that the maximum shaft deflection will not exceed 0.01 inch per foot of length at rated load. Torsional shaft deflection shall not exceed 0.08 degrees per foot of shaft length at rated load. Shafting of non-uniform diameter shall be made of hot-rolled steel, shall be turned with fillets of not less than 1/4 inch radius where changes of section occur, and shall be polished at the bearings and seals. Plain shafting 6 inches and smaller in diameter and line shaft of all sizes may be made of cold-finished steel. Shaft fillet radii at bearings shall be the maximum size recommended by the bearing manufacturer for the bearing being used. The spacing between line shaft bearings shall not exceed the values shown in the following table:

MAXIMUM SPACING BETWEEN BEARINGS IN FEET			
SHAFT DIAMETER	AT SPEED (RPM) OF:		
in.	0 TO 100	101 TO 300	301 AND HIGHER
1-1/2	8	8	8
2	10.5	10.5	10.5
2-1/2	15	15	13
3	17.5	16	14.5
3-1/2	19	16	15.5
4	21	16	16

When the shaft speed exceeds 400 RPM, the bearing spacing shall not exceed that determined by the following formula, or the above table, whichever is less:

$$L = (166) (D/N)^{0.5}$$

Where: L = Distance between bearings in feet.

D = Shaft diameter in inches.

N = Maximum shaft speed in RPM.

2.6 KEYS AND KEYSEATS

Keys and keyseats shall conform to ASME B17.1.

2.7 PINS

The allowable bearing pressure for equalizer pins in steel frames shall not exceed 9,000 psi of projected area for the fixed portions, and 5,000 psi for the movable portions. The allowable bearing pressure for non-revolving sheave pins in steel frames shall not exceed 9,000 psi of projected area.

2.8 LUBRICATION

Oil lubrication shall be provided for gear trains, gear- or grid-type couplings, and speed reducers except that grease lubrication will be acceptable for drum gears and the final gear drive on the trolley and gantry wheels. Lubrication for other mechanical operating parts shall be by means of high-pressure grease, and industrial button-type fittings shall be used. The lubricating fittings of journals or bearings shall be readily accessible and where necessary shall be piped to convenient points using copper or brass pipe of ample size, adequately fastened with grommets and clamps to prevent vibration during gantry operations. Drain and fill plugs of speed reducers and gear cases shall be located so as to be readily accessible and shall be provided with extension piping where required. Lubricants shall be Mountain Oil MT454 Ultra Temp and Mountain Oil DY654 to be compatible with what is currently used at the project. If the Contractor wishes to use an "or equal" product, data shall be furnished showing that the proposed product is compatible with the lubricants currently used at the project.

2.9 GUARDS, COVERS, AND DRIP PANS

Safety guards shall be provided throughout the crane where necessary for protection of operators or others from injury. Couplings, shafts, projecting set screws, keys, and similar rotating parts shall be provided with metal guards in accordance with the applicable requirements of ASME B15.1. Wires or other parts carrying current at any time shall be adequately guarded to prevent persons or equipment from coming in contact with live parts. Suitable drip pans made of steel plate shall be provided to collect oil and grease which may drop from operating parts. Drip pans shall be removable for cleaning without dismantling of equipment.

2.10 MACHINERY EFFICIENCIES

The machinery efficiencies used for calculating the horsepower of the hoist motors shall not exceed those given below for the respective components:

- a. $E = 0.99n$ for sheaves with roller bearings.
- b. $E = 0.98n$ for shaves with sleeve bearings.
- c. $E = 0.95n$ for spur, spiral bevel, helical or herringbone gears with roller bearings.

d. $E = 0.93n$ for spur, spiral bevel, helical or herringbone gears with sleeve bearings.

E = efficiency

N = number of pairs of gears or number of sheaves between the drum and equalizer sheave passed over by each part of the moving rope attached to the drum.

PART 3 EXECUTION

3.1 MAIN HOISTS

3.1.1 General

Pinions and bull gears for the main hoists shall be cleaned and inspected. The top gear guard sections shall be removed for inspection and cleaning of the pinions and bull gears.

3.1.2 Main Hoist Pinions and Bull Gears

All components of the gear reducer shall be completely cleaned and inspected. All debris and sludge inside the gear reducer shall be removed and the gear reducer interior shall be wiped clean. New seals shall be installed.

3.1.3 Main Hoist Gear Reducers

All components of the gear reducer shall be completely cleaned and inspected. All debris and sludge inside the gear reducer shall be removed and the gear reducer interior shall be wiped clean. New seals shall be installed.

3.1.4 Mounting Bases

Mounting bases shall be modified or replaced to suit new equipment. The mounting bases shall be welded directly to the existing mounting plate and/or trolley structure, not to the checkered floor plate. Drawings and computations for the proposed mounting base modifications shall be submitted to the Government for approval.

3.1.5 Miscellaneous Items

Miscellaneous items such as bolts for replaced components, keys, grease fittings, grease line tubing, spiral pins, snap rings, etc. shall be replaced with new during rebuilding/reassembling of components.

3.2 AUXILIARY HOISTS

3.2.1 General

Existing motors, brakes, and couplings shall be replaced with new ones. Work on other components is specified below. See SECTION 16050 for requirements for motors and brakes.

3.2.2 Auxiliary Hoist Pinions and Bull Gears

Pinions and bull gears for the auxiliary hoists shall be cleaned and inspected. The top gear guard sections shall be removed for inspection and

cleaning of the pinions and bull gears.

3.2.3 Auxiliary Hoist Gear Reducers

All components of the gear reducer shall be completely cleaned and inspected. All debris and sludge inside the gear reducer shall be removed and the gear reducer interior shall be wiped clean. The bearings in the gear reducers shall be replaced. New seals shall be installed.

3.2.4 Mounting Bases

Mounting bases shall be modified or replaced to suit new equipment. The mounting bases shall be welded directly to the existing mounting plate and/or trolley structure, not to the checkered floor plate. Drawings and computations for the proposed mounting base modifications shall be submitted to the Government for approval.

3.2.5 Miscellaneous Items

Miscellaneous items such as bolts for replaced components, keys, grease fittings, grease line tubing, spiral pins, snap rings, etc. shall be replaced with new during rebuilding/reassembling of components.

3.3 TROLLEY DRIVES

3.3.1 General

Existing motors and brakes shall be replaced with new ones.

3.3.2 Reducers

Reducers for the trolley drive shall be inspected. Oil shall be drained and discarded. Sludge and debris inside the reducer shall be removed. Gears, shafting, and gearcases shall be inspected. New seals shall be installed.

3.3.3 Mounting Bases

Mounting bases shall be modified or replaced to suit new equipment. The mounting bases shall be welded directly to the existing mounting plate and/or trolley structure, not to the checkered floor plate. Drawings and computations for the proposed mounting base modifications shall be submitted to the Government for approval.

3.3.4 Miscellaneous Items

Miscellaneous items such as bolts for replaced components, keys, grease fittings, grease tubing, spiral pins, snap rings, etc. shall be replaced with new during rebuilding/reassembling of components.

3.3.5 Wheel Truck Assembly

Wheel trucks, pins, wheels, axles, gears, and shafting shall be cleaned and inspected without disassembling the wheel truck assembly. Alignment to bridge shall be verified and corrected.

3.3.6 Couplings

Couplings shall be cleaned and inspected. New seals shall be installed.

3.4 BRIDGE DRIVE

3.4.1 General

The existing motor and brake shall be replaced with a new one. Alignment of all bridge trucks need to be checked and corrected. The northeast truck is currently experiencing some misalignment.

3.4.2 Reducers

Reducers for the bridge drive shall be inspected. Oil shall be drained and discarded. Sludge and debris inside the reducer shall be removed. Gears, shafting, and gearcases shall be inspected. New seals will be provided.

3.4.3 Mounting Bases

Mounting bases shall be modified or replaced to suit new equipment. The mounting bases shall be welded directly to the existing mounting plates. Drawings and computations for the proposed mounting base modifications shall be submitted to the Government for approval.

3.4.4 Miscellaneous Items

Miscellaneous items such as bolts for replaced equipment, keys, grease fittings, grease tubing, spiral pins, snap rings, etc. shall be replaced with new during rebuilding/reassembling of components.

3.4.5 Couplings

Couplings shall be cleaned and inspected. New seals shall be provided.

3.5 HOOK SAFETY LATCHES

Safety latches on the main hoist crane hooks shall be cleaned and inspected. If damaged or missing, they shall be replaced with new safety latches which meet the criteria of ASME B30.10.

3.6 BUMPER SAFETY CABLES

Means shall be installed on the crane bumpers to retain the bumpers in case of broken or loosened mounting connections.

3.7 FURNISH NEW BRIDGE TRUCK (OPTIONAL)

A spare bridge truck shall be fabricated by the Contractor. The wheel truck shall be identical to all existing wheel trucks and constructed based upon the original drawings, except for the additional manufacture of a motor mount for proper alignment of the motor with the gearboxes. The wheel truck consists of one equalizer beam, one idler truck frame, one driver truck, one drive motor bracket, and associated wheels, axles, bearings, bushings, gears, motors, and limit switches.

3.8 BRIDGE TRUCKS (OPTIONAL).

3.8.1 Removal and Reinstallation

Bridge truck(s) shall be removed from the crane and shipped to the Contractor's facility for refurbishment. Upon completion of the

refurbishment, the bridge truck(s) shall be inspected, returned to the project and reinstalled on the bridge crane. Reinstalled trucks shall have the alignment adjusted in accordance with ASME B30.2.

3.8.2 Refurbishment

Bridge trucks shall be removed from the emergency crane and rebuilt. Bearings for wheel axles and shafting shall be replaced. Pins, axles, gears, couplings, and shafting shall be inspected. Existing axles, gears, and shafting shall be checked against the reference drawings and any deviations shall be brought to the attention of GQAR. Metal safety guards shall be furnished for couplings in accordance with ANSI B15.1.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 15 - MECHANICAL

SECTION 15995

MISCELLANEOUS HIRE

PART 1 GENERAL

1.1 GENERAL INFORMATION

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 SERVICES OF SKILLED CRAFTSMEN (OPTIONAL)

-- End of Section Table of Contents --

SECTION 15995

MISCELLANEOUS HIRE

PART 1 GENERAL

1.1 GENERAL INFORMATION

As the condition of crane cannot be determined until the crane is disassembled, it is anticipated that work in addition to that specified in other sections may be required. This additional work will be directed in writing to be accomplished under an item or items in this section. Where work is specified in other sections to be accomplished under these items, no work shall be accomplished until the Government inspects the item and specific directions are given in writing. The unit prices to be charged for labor for additional work shall not exceed the unit price quoted in the Bidding Schedule which price shall include the price for supervision, equipment, tools, labor, materials, transportation of items to and from site to work place, overhead, and incidentals required for the work. The estimated quantities in the Bidding Schedule for these items are for canvassing bids and more or less work than indicated may be required.

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

3.1 SERVICES OF SKILLED CRAFTSMEN (OPTIONAL)

Services of skilled craftsmen will be required if the Government discovers work that must be performed that is not included in the drawings and specifications and is not included in any change orders. The additional work could consist of machinist/millwright work; electrical work; metalwork consisting of welding, drilling, cutting, or grinding; or painting work. The Contractor shall furnish all tools and equipment as incidental items for all skilled craftsman work. This work shall be performed by the Contractor only when directed, in writing. Prices for skilled craftsman hours included in applicable items in The Schedule, Section 00010 are the prices to be paid only for this additional directed work and these prices shall not be used when negotiating change orders.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 16 - ELECTRICAL

SECTION 16050

ELECTRICAL WORK AND EQUIPMENT

PART 1 GENERAL

- 1.1 DESCRIPTION OF WORK
- 1.2 REFERENCES
- 1.3 SUBMITTALS
- 1.4 DIMENSIONED OUTLINE DRAWINGS
- 1.5 GENERAL REQUIREMENTS
 - 1.5.1 Type of Equipment and Quality
 - 1.5.2 Code
 - 1.5.3 Nameplates
 - 1.5.4 Tests
 - 1.5.5 Storage and Handling
 - 1.5.6 Warranty
- 1.6 MAINTENANCE
 - 1.6.1 Spare Parts

PART 2 PRODUCTS

- 2.1 POWER SUPPLY
 - 2.1.1 General
 - 2.1.2 Main-Line Conductor System
- 2.2 CONNECTIONS TO TROLLEYS
- 2.3 CONTROL SYSTEMS AND EQUIPMENT
 - 2.3.1 General
 - 2.3.2 Operating Features
 - 2.3.2.1 Hoisting and Lowering
 - 2.3.2.2 Hoisting and Lowering Performances
 - 2.3.2.3 Bridge and Trolley Travel
 - 2.3.2.4 Bridge and Trolley Travel Performances
 - 2.3.2.5 Positioning Accuracy
 - 2.3.3 Location of Controls and Control Equipment
 - 2.3.4 Variable Frequency Drives
 - 2.3.5 Resistors
 - 2.3.6 Protective Features
 - 2.3.6.1 General
 - 2.3.6.2 Undervoltage Protection
 - 2.3.6.3 Reverse-Phase and Open-Phase Protection
 - 2.3.6.4 Protective Panel
 - 2.3.7 Master Switches
 - 2.3.8 Limit Switches
 - 2.3.9 Load Cells
 - 2.3.10 Push-button Station
 - 2.3.11 Control Cabinets
- 2.4 WARNING SIGNALS
 - 2.4.1 Travel Warning
 - 2.4.2 Crane Operation
- 2.5 MOTORS
 - 2.5.1 Motor Size and Speed
- 2.6 ELECTRIC HOLDING BRAKES
 - 2.6.1 General

- 2.6.2 Type
 - 2.6.3 Torque Rating
 - 2.6.4 Release
 - 2.6.5 Adjustment
 - 2.6.6 Mechanical Construction
 - 2.6.7 Designation and Markings
 - 2.7 LIGHTING SYSTEM
 - 2.7.1 General
 - 2.7.1.1 Lighting Transformer
 - 2.7.2 Panelboard
 - 2.7.3 Air Circuit Breakers
 - 2.7.4 Working Area Floodlights
 - 2.7.5 Cab Lights
 - 2.7.6 Convenience Outlets
 - 2.7.7 Power Outlet
 - 2.8 CONDUIT
 - 2.8.1 General
 - 2.8.2 Fittings
 - 2.8.3 Outlet, Junction, and Pull Boxes
 - 2.9 INSULATED WIRE AND CABLE
 - 2.9.1 General
 - 2.9.2 Conductors
 - 2.9.3 Insulation
 - 2.9.4 Jackets
 - 2.9.5 Wire Near Resistors
 - 2.9.6 Control Panel Wiring
 - 2.9.7 Linked Carrier System
 - 2.9.8 Fire Resistance
 - 2.10 TERMINAL BLOCKS
- PART 3 EXECUTION
- 3.1 EQUIPMENT REMOVAL
 - 3.2 EQUIPMENT INSTALLATION
 - 3.2.1 General
 - 3.2.2 Manufacturer's Technical Services
 - 3.2.3 Conduit
 - 3.2.4 Wire and Cable
 - 3.3 ELECTRICAL TESTS
 - 3.3.1 General
 - 3.3.2 Electric Holding Brakes Tests
 - 3.3.3 Control System Equipment Tests
 - 3.3.3.1 Controller
 - 3.3.3.2 Limit Switches
 - 3.3.4 Motors
 - 3.3.5 Wiring Tests

-- End of Section Table of Contents --

SECTION 16050

ELECTRICAL WORK AND EQUIPMENT

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

The work specified under this section includes the removal of the operator's cab, the removal of all electrical equipment and wiring on the bridge crane, and the design, fabrication, factory testing, furnishing, and installation of the operator's cab and electrical equipment and associated systems. The equipment and associated systems includes motors, brakes, complete control systems, conduit, wiring, and auxiliary devices required to replace the crane's electrical power and control systems.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(2002) National Electrical Safety Code
IEEE 383	(1974; R 1992) Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA C80.1	(1994) Rigid Steel Conduit - Zinc Coated
NEMA FB 1	(1993; Rev 1) Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
NEMA ICS 1	(2000) Industrial Control and Systems General Requirements
NEMA ICS 2	(2002) Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts
NEMA ICS 6	(1993; R 2001) Industrial Control and Systems: Enclosures
NEMA ICS 8	(2000) Industrial Control and Systems Crane and Hoist Controllers
NEMA MG 1	(2003) Motors and Generators
NEMA OS 1	(1996) Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports

NEMA PB 1	(2000) Panelboards
NEMA ST 20	(1992; R 1997) Dry-Type Transformers for General Applications
NEMA WC 3	(1992; Rev 1 1994) Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA WC 57	(1995; Rev 2 1998) Standard for Control Cables
NEMA WC 70	(1999) Standard for Nonshielded Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2002) National Electrical Code
---------	---------------------------------

UNDERWRITERS LABORATORIES (UL)

UL 360	(2002; Rev thru June 2003) Liquid-Tight Flexible Steel Conduits
UL 467	(1993; Rev thru Feb 2001) Grounding and Bonding Equipment
UL 489	(2002; Rev thru May 2003) Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
UL 514A	(1996; Rev thru Nov 2001) Metallic Outlet Boxes
UL 514B	(1997; Rev thru Feb 2002) Fittings for Cable and Conduit
UL 886	(1994; R 1999, Bul. 2002) Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Dimensioned Outline Drawings; G, HDC

SD-03 Product Data

Motors; G, HDC

- a. Complete descriptive specification of each type motor to be furnished, with necessary cuts, photographs, and drawings to clearly indicate the construction, the treatments used to prevent corrosion of parts, bearing construction, and type of insulation and treatment on the windings. Full NEMA standard name plate data and dimension sheets shall be furnished.
- b. Motor characteristic curves or tabulated data (test or calculated) of each motor to be furnished indicating the speed, power factor, efficiency, current, and kilowatt input, all plotted and tabulated against percent rated motor torque or percent rated motor load.
- c. Characteristics of the position encoders furnished with the motor.

Electric Holding Brakes; G, HDC

- a. Complete descriptive data covering each type of brake to be furnished with necessary cuts, photographs, and drawings to indicate clearly the construction of the brake and the materials used. Means of release and torque adjustment of holding brakes, specifications and characteristics, including range of torque adjustment of holding brakes, input current, minimum voltage at which brake will release, rectifier unit specifications and characteristics, and all other features which are required to demonstrate that the electrical brakes conform to the requirements of the specifications.
- b. Calculations to determine the torque rating for each brake.

Control Systems and Equipment; G, HDC

Variable Frequency Drives; G, HDC

- a. Complete descriptive data, including ratings and catalog designations covering all main component equipment parts and assemblies of the control system, the panel layouts and dimensioned outline drawings, schematic and wiring diagrams, interconnecting wiring diagram, and construction wiring diagrams. The schematic wiring diagrams shall include power and control circuitry, and shall indicate the collectors. The wiring diagrams shall indicate the wiring for individual items of equipment within all panels and equipment items, terminal board connections, wire designations, and size and type of wire. The wiring diagrams shall also show all connections between individual panels and between separately located items.
- b. A description of the scheme of operation and of the provisions for adjusting the operating characteristics in the field.
- c. Complete description of the protective panel and air circuit breaker panelboards, including rating of circuit breakers, contactors and relays, and catalog designations of each item.
- d. Curves showing the tripping time versus current characteristics of the proposed overload relays.

e. Performance characteristic curves (test or calculated) of the control system for each motion of the crane for each speed control setting of the master control switches. The performance characteristic curves for the hoist control system (hoisting and lowering) shall be plotted in terms of hook load and speed, the hook load being the abscissa and hook speed the ordinate. The performance characteristic for other motions shall be plotted in terms of travel speed and load.

Master Switches; G, HDC

Complete descriptive data or literature covering the master switches, including ratings, catalog designations, and dimensioned outline drawings.

Limit Switches; G, HDC

Complete descriptive data or literature covering the limit switches that clearly indicates the construction, materials used in the parts, rating, accuracy of tripping and reset, method of adjustment, and safeguards.

Load Cells; G, HDC

Complete descriptive literature and specifications with necessary catalog cuts, photographs, and drawings to clearly indicate the construction of the units.

Lighting System; G, HDC

Complete descriptive data covering the lighting system with necessary cuts, photographs, catalog data, and drawings to indicate the type and rating of transformers, breakers, panelboard, lighting fixtures, ballasts, and convenience outlets proposed.

Conduit; G, HDC

Data to indicate conduit type and size, locations of the fittings, conduits, splice and junction boxes, and the number and the sizes of conductors in each conduit.

Wire and Cable; G, HDC

Data to demonstrate that the proposed wire and cable conform to these specifications. This information shall include the name of the manufacturer and trade name or designation, the standard to which manufactured (NEMA, etc.), voltage rating, insulation material and thickness, and other pertinent features. Procurement of the wire and cable shall not be made until the data has been approved.

Conductors; G, HDC

Collectors; G, HDC

Complete descriptive specifications of the contact conductor and collector system components to be furnished with necessary cuts,

photographs, and drawings to clearly indicate the construction and mounting of the components. Calculations to determine the sizing of the conductor and collector system.

SD-06 Test Reports

Electric Holding Brakes Tests; G, HDC

Control System Equipment Tests; G, HDC

Wiring Tests; G, HDC

SD-07 Certificates

Torque rating;

Certification of the factory adjusted torque rating of electric holding brakes.

1.4 DIMENSIONED OUTLINE DRAWINGS

Dimensioned outline drawings shall be submitted for each of the following:

- a. Each type of motor and brake.
- b. Each limit switch.
- c. Each master switch.
- d. Operator's cab.
- e. Detail drawing or drawings showing the method of mounting the lighting fixtures and a description of the procedure to be followed in relamping.
- f. Proposed modifications to the lighting and outlet systems, if any.
- g. Drawings and data to show complete conduit routing, including detailed location of all drilling required in structural members.
- h. Drawings and data to indicate conduit type and size, locations of the fittings, conduits, splice and junction boxes, and the number and the sizes of conductors in each conduit.
- i. Locations, dimensions, and layout of all electrical equipment, including cabinets, motors, brakes, controls, and interconnecting conduits. Drawings shall include detailed locations of all drilling required in structural members. Weights of items shall be included.

1.5 GENERAL REQUIREMENTS

1.5.1 Type of Equipment and Quality

All equipment shall be of the type normally furnished for crane applications and service. All motors and control equipment shall be the products of manufacturers specializing in the production of this type of equipment as evidenced by the existence of previously published catalog data. All equipment shall be new and unused. Defective equipment or equipment damaged in the course of installation shall be replaced or

repaired as approved. Equipment and materials for the same, similar, or allied services shall be of the same manufacturer and type, and when of the same rating shall be interchangeable.

1.5.2 Code

The installation shall be in accordance with NFPA 70 and IEEE C2 except where otherwise specifically indicated on the contract drawings or called for in the specifications. Omission of details on the drawings or in the specifications shall not be construed as permitting deviations from Code requirements.

1.5.3 Nameplates

In addition to the nameplate provided by the manufacturer, each item of electrical equipment, other than motors and electric holding brakes, shall be provided with a nameplate designating its function and service. All proposed designations shall be submitted to the Contracting Officer for approval. Nameplates shall be of 20 gage stainless steel with embossed lettering, laminated plastic with lettering engraved through upper layer, or anodized aluminum, stainless steel, plastic, or other material of equivalent durability which has engraved or etched lettering filled with enamel of a contrasting color. All nameplates shall be attached to the equipment with corrosion resisting screws.

1.5.4 Tests

Tests, unless otherwise specified, shall be made in conformity with the applicable Standards of the Institute of Electrical and Electronics Engineers (IEEE).

1.5.5 Storage and Handling

Materials and equipment shall be suitably protected from dampness, dust and physical damage.

1.5.6 Warranty

A warranty shall be supplied stating that all items are free from defects in material, design and workmanship for one year from the date of acceptance. Upon receipt of notice from the Government of failure of any of the items, new replacement parts shall be furnished and promptly installed.

1.6 MAINTENANCE

1.6.1 Spare Parts

One set of manufacturer's recommended spare parts for the crane shall be furnished and delivered to the site. The spare parts shall be packaged for long term protection and storage. The packaging shall be legibly labeled to identify the spare parts. A list of the furnished spare parts shall be included in Maintenance Manual.

- a. One complete variable frequency drive of each type and size used.
- b. Six fuses of each type and rating used shall be furnished as spares.
- c. Two indicating light assemblies of each type.

- d. Six lamps of each type used in indicating lights.
- e. Two sets of control switch replacement contacts for each 10 or fraction thereof of each type.
- f. Two sets of replacement contacts for each type of contactor used.
- g. Two replacement coils for each type of contactor used.
- h. Two replacement auxiliary relays for each type used.
- i. Two semiconductor devices (discrete or integrated circuit) including MOV's for surge protectors except for those furnished on printed circuit boards for each 10 or fraction thereof of each type used.
- j. Two electronic equipment power supplies of each type used.
- k. Two limit switches of each type used for trolley and hoist travel.
- l. Two sets of bearings and seals for each size and type of motor.
- m. One brake shoe replacement kit for each electric holding brake.
- n. One replacement encoder of each type used for hoist motors.
- o. One brake coil for each type and size used.
- p. One brake rectifier and control unit of each type used.

PART 2 PRODUCTS

2.1 POWER SUPPLY

2.1.1 General

Electrical power for the bridge crane is supplied to the existing rigid copper angle conductors from a nominal 480-volt, 3-phase, 60 Hz ungrounded system. The existing main-line conductors and current collectors and all other wire and equipment shall be replaced. The incoming power circuit breaker shall be a 600-volt, 3-pole, manually-operated air circuit breaker having suitable ampere rating. Short circuit protection only shall be provided. The breaker shall be mounted in the protective panel. A circuit breaker shall be provided for each circuit connected to the line side of the incoming AC supply. Each circuit controlling a separate crane motion shall have individual protection. Fused disconnects will be acceptable if AC circuits are grouped on common breakers or if AC circuits are connected to the load side of the AC motor circuit breakers. In the latter case, motor disconnect switches shall be provided so that control circuits may be tested without energizing the motor. Circuit breakers which are not mounted in the control cabinets shall be mounted in the protective panel.

2.1.2 Main-Line Conductor System

The main-line conductor/collector system shall be complete with insulated mounting hardware. Voltage rating shall be 600 volt, minimum.

- a. Conductors. The conductors shall be copper with flexible

insulating shrouds that open to expose the live conductor only as the collector shoe passed along. They shall be 3-phase, and rated large enough to service the worst-case loading and limit the voltage drop to 2 percent. Minimum ampacity shall be 500A.

b. Collectors. The collectors shall be the sliding shoe type, spring-loaded, with a rating adequate to serve the worst-case loading of the Bridge Crane, but not less than the rating of the feeder breaker. Each phase shall have an assembly with two shoes placed in tandem, spaced approximately ten inches apart. Shoes shall be easily replaceable. Collectors shall be complete with mounting assembly for installation on the bridge structure.

2.2 CONNECTIONS TO TROLLEYS

Power and control circuits shall be brought to the trolley by means of a hinged or linked carrier system supporting jacketed and color-coded multiple conductor power and control cables similar and equal to POWERTRAK as manufactured by Gleason Reel, 800 Horicon Street, Mayville, Wisconsin, 53050, phone: 414/387-4120. The conductors of all cables shall be terminated at each end by suitable terminal lugs connected to terminal blocks mounted in junction boxes of Type 4 construction conforming to NEMA ICS 6. Power and control circuits shall be segregated and terminated in separate junction boxes. Two extra conductors shall be provided in each control cable.

2.3 CONTROL SYSTEMS AND EQUIPMENT

2.3.1 General

The drive control systems for hoists shall be variable frequency AC with closed-loop flux vector control. The drive control systems for travel shall be variable frequency AC or flux vector if necessary to meet the accuracy requirements. Hoist and travel motions shall be controlled by master switches. All hoist and travel motions shall be independently operable and capable of simultaneous usage. The controls shall have static reversing of the direction of hoist or travel. The controls shall provide smooth starting, stopping, acceleration, and deceleration at all speeds and loads while operating within safe limits of overload currents. Controls shall be designed to fail-safe and cause the brakes to set automatically in case of control malfunction, protective device operation, or loss of power.

The controls shall be designed so that, no matter how erratically the master switch handle may be operated, there will be no damage to control or equipment, nor any danger of dropping a hoist load. Drives and other controls shall be fully functional for testing when the motors are disconnected. All AC control shall be at 120 volts, maximum.

Controls shall be provided with field-selectable settings to allow driving the motors at greater than rated speeds when loads are light. The hoist and travel speed controls shall be provided with range selector switches which will allow the operator to select full-range control or reduced range control for full travel of the master switch. Reduced range control shall provide that, when selected, full travel of the master switch shall continuously vary the speed setting from zero to a lower value within the full speed range. The reduced range value shall be field-programmable to between 10 and 30 percent of full speed. Drives and other controls shall be fully functional for testing when the motors are disconnected. All AC control shall be at 120 volts, maximum.

2.3.2 Operating Features

2.3.2.1 Hoisting and Lowering

Positive control of the lowering movement of all hoist hooks shall be maintained under all conditions of load. Mechanical or electrical load brakes shall not be used. The hoist controls shall provide 5 points of speed control for both hoisting and lowering, and shall provide regenerative or dynamic braking in the lowering direction. Means shall be provided to limit the maximum torque a hoist motor can develop, and the controls shall be adjusted so that hook loads greater than 200 percent of the rated hook load cannot be lifted. The load-speed characteristics shall be inherent in the controls at each speed setting. Speed control in the lowering direction shall be such as to permit the operator to stop the hook from any speed point, without time delay by returning the master switch to the OFF position. Control circuits and selector switches shall be provided to allow the two main hoists to be operated from one master switch when desired. The main hoist controls shall be provided with adjustable compensation that allows initial adjustment of the speed between main hoists operating at the same selected speed and load, to be within 1 percent of each other.

2.3.2.2 Hoisting and Lowering Performances

The following hoisting and lowering performances are required, and shall be suitable for administering all loads, from no load on the hook to rated load:

- a. The first (slowest) speed control setting for hoisting and lowering shall be 5 percent rated hoisting speed.
- b. Main Hoist. The last (fastest) speed control setting for hoisting and lowering shall be 100 percent rated hoisting speed.
- c. Auxiliary Hoist. The last (fastest) speed control setting for hoisting and lowering shall provide a hoisting speed of 100 percent rated speed at rated load. At less than 100 percent rated load, the setting shall be field-programmable for a range of 100 to 200 percent rated speed, inversely proportional to load. Initial setting of this point shall be 100 percent rated speed.
- e. Three intermediate speed control settings for hoisting and lowering shall be evenly spaced between 10 percent and 100 percent rated hoisting speed.

2.3.2.3 Bridge and Trolley Travel

Travel motion controls shall provide essentially constant speed on each respective control point for all hook loads and shall provide dynamic or regenerative braking. Five points of speed control shall be provided for each direction of travel. Control circuits and selector switches shall be provided to allow the two trolley drives to be operated from one master switch when the trolleys are electrically or mechanically linked together. Sufficient speed droop or other acceptable means shall be provided in the travel drives to permit satisfactory operation when two drives are mechanically interlocked. Compensating circuits shall be provided so that the steady-state operating deviation and service deviation band of speed regulation shall each not exceed 1 percent of the rated speed for all hook loads. The circuit shall be arranged so that the operator may hold the control on any accelerating point.

2.3.2.4 Bridge and Trolley Travel Performances

Bridge and trolley travel control shall provide travel speeds as follows:

- a. The first (slowest) speed control setting for travel shall be 10 percent rated travel speed.
- b. The last (fastest) speed control setting for travel shall be 100 percent rated travel speed.
- c. Three intermediate speed control settings for travel shall be evenly spaced between 10 percent and 100 percent rated travel speed.

2.3.2.5 Positioning Accuracy

The control system shall be so designed that it will be possible to limit the motion of any hoist, trolley travel, or bridge travel motor to not more than the value specified below when starting from complete standstill with any load up to and including rated load.

MOTION	POSITIONING ACCURACY	
	cm	(inches)
Main Hoist	0.1587	(0.0625)
Auxiliary Hoist	0.1587	(0.0625)
Bridge Travel	0.1587	(0.0625)
Trolley Travel	0.1587	(0.0625)

2.3.3 Location of Controls and Control Equipment

Master control switches and emergency stop push-button shall be located on the operator's chair in an arrangement as shown as that the operator can actuate the master control switches when sitting in a position that will afford the best view of the respective operation. The direction of movement of the operating handles of all travel master control switches shall simulate the motion controlled. The handles of the hoist master control switches shall move away from the operator for lowering and toward the operator for hoisting. The protective panel and circuit panel boards shall be located in the operator's cab. The cabinet or cabinets containing the directional magnetic contactors and control equipment shall be mounted on the bridge girder at a location that will permit easy access for the inspection and maintenance of the contactors and wiring. The cabinets shall be mounted so that any meters or indicating displays are no higher than six feet when standing in front of the cabinet.

2.3.4 Variable Frequency Drives

The drive controller for each motion shall provide true four-quadrant control and shall be the solid state, pulse width modulated (PWM) type with adequate capacity to drive its motor or motors at all specified loads and speeds. It shall be rated for continuous duty with an ambient temperature of 40 degrees C and at the motor current necessary to lift rated load at any speed and shall have a one-minute rating of 150 percent current (200 percent rated load). Power factor shall be 0.95 or above from full speed to zero speed and at rated torque. Speed regulation shall be less than 1.0 percent from no-load to full-load, over the entire frequency range. Acceleration and deceleration shall be separately adjustable from 0.1 to 20 seconds. Control shall include torque proving feature, to verify that

enough motor torque has built up before the brake is released. Hoist drives shall have closed-loop control with feedback from a motor-shaft-mounted encoder. Minimum protection shall consist of line isolating transformers, line reactors if necessary, transient voltage and current surge suppressors, and either current limiting rectifier type fuses or static instantaneous over-current circuits with sensing in each phase of the incoming line. Motor overload protection shall be included with the controller. The control circuit shall include an adjustable-operating current-limiting circuit capable of limiting maximum current to not more than the current necessary to obtain 200 percent motor torque.

2.3.5 Resistors

Resistors for regenerative or dynamic braking circuits shall be of the nonbreakable, corrosion-resisting type, shall have a low temperature coefficient, and shall be rated for continuous duty.

2.3.6 Protective Features

2.3.6.1 General

Undervoltage, reverse-phase, and open-phase protection shall be provided. Overload Protection shall be provided for each motor.

2.3.6.2 Undervoltage Protection

Undervoltage protection shall be accomplished by means of a 3-pole main-line magnetic contactor with its operating coil wired into the control circuit so that upon the functioning of any motor overload relay, or the occurrence of a power outage, the power to all motors shall be interrupted and it shall be necessary to return all master switches to the "OFF" position before the main line contactor can be reclosed. A push-button control station shall be provided to control the opening and closing of the main line contactor.

2.3.6.3 Reverse-Phase and Open-Phase Protection

Reverse-phase and open-phase protection shall be provided by a suitable induction type relay or relays that will open the main line contactor upon the occurrence of a reverse or open-phase condition.

2.3.6.4 Protective Panel

All protective equipment specified above and the main power disconnecting circuit breaker shall be mounted on steel panels and shall be wired to terminal blocks or studs complete and ready for making external connections. The panel shall be enclosed in a cabinet as specified in paragraph "Control Cabinets." Means shall be provided to permit the operation of the incoming power circuit breaker without opening the cabinet door and to lock it in the open position.

2.3.7 Master Switches

Master control switches for use with the control equipment shall be of a type designed for mounting on an operator's chair. Contacts shall be rated not less than 15 amperes at 600 volts AC and shall be cam operated, except as specified below, double break (bridging type), and shall be renewable. The contact operating mechanism shall be of a design that will ensure positive operation of the contacts. Master switches mounted with the

contact assembly enclosed in dustproof, floor, wall, or pedestal mounted enclosures shall be of the open type. The contacts shall be wired to convenient terminal blocks within the enclosure. The enclosures shall have removable covers to permit easy access to the wiring and to the switching mechanism. Master switches mounted with the contact assembly below an open desk shall have NEMA Type 1 contact assembly enclosures which provide ample space for making wiring connections and for inspection and maintenance. The operating mechanism housing shall be cast metal construction or the sealed flexible boot type. The operating handle shall move in a vertical plane, shall be in a vertical position when the switch is in the "OFF" position, shall be provided with a star wheel and spring loaded pawl that will give a definite "feel" to the operating points and with more force required out of the "OFF" position, and a positive means to return it to the "OFF" position when released by the operator (deadman's handle). Control handles shall be identified as to the motion controlled by the respective master switch by color coding as follows:

MOTION	COLOR
-----	-----
Hoist	Vivid Orange
Auxiliary Hoist	Black
Trolley Travel	Brilliant Yellow
Bridge Travel	Light Blue

Color coding shall be accomplished by either painting the entire handle or by the use of colored plastic knobs.

2.3.8 Limit Switches

Limit Switches for controlling the upper limit of travel of all hoists shall be of the normally closed contact, weighted lever type, actuated directly by the hoist hooks or the hoist blocks and capable of being reset by reversing the movement of the hoist. Limit switches for controlling the lower limit of the main hoist and auxiliary hoist shall be of the traveling nut or rotating cam type, driven through gearing by the hoist. All limit switches shall be provided with nonventilated NEMA Type 12 enclosures and shall be mounted where they will be readily accessible for adjustment and inspection.

2.3.9 Load Cells

A load cell shall be placed on each main hoist to provide alarm circuits and continual load readout. The load cells shall be electronic type with a load indicator. The load indicator with digital display shall be calibrated in tons and to read up to 500 tons and be accurate to within 2 percent of the rated capacity of the load cell.

2.3.10 Push-button Station

The emergency "STOP" push-button for removal of power from the crane motion circuits shall be of the momentary contact, heavy-duty type. The emergency "STOP" push-button shall be connected to operate the contactor specified in paragraph "Undervoltage Protection" and shall be provided with a red mushroom head. The "START-STOP" push-buttons for activating the crane motion circuits (main-line contactor) shall be of the momentary contact, heavy-duty type. The contacts shall have a pilot and control circuit contact rating of 600-amp at 600-volts in accordance with NEMA ICS 2.

2.3.11 Control Cabinets

Control cabinets shall be made of steel sheets, and shall conform to NEMA ICS 6 for NEMA Type 12 construction shall be provided with the necessary conduit entrances and gasketed hinged door or doors as necessary to permit removing any device and the making of all wiring connections. Doors shall be provided with a 3-point latch with means to permit locking the door in the closed position and shall have door swings of not less than 180 degrees. Key locks shall be provided and all locks shall be keyed the same. Six keys shall be provided. The doors shall be sized so that they can be fully opened when mounted on the crane.

2.4 WARNING SIGNALS

2.4.1 Travel Warning

A 25 cm (10 inch), single stroke, electrically operated bell shall be installed at a suitable location on the exterior of the cab. The bell shall have an ANSI rating of not less than 65 decibels at 3 meters (10 feet), and shall operate on 60 Hz, 115 volts. A timer shall be provided to give stroking impulses to the bell at approximately five-second intervals and shall be connected into the bridge travel master switch so that movement of the switch from the "OFF" position in either direction initiates the signal. A foot-operated switch shall also be provided and located in the operator's cab for operation of the bell when the crane is at standstill for as long as the switch is actuated.

2.4.2 Crane Operation

A flashing amber light shall be installed under each operator's cab. The lights shall operate automatically whenever the crane is energized.

2.5 MOTORS

Motors, except as otherwise specified herein, shall conform to the provisions of NEMA MG 1. Motors shall be 230/460 or 460-volt, 3-phase, 60 Hz, AC, inverter duty, squirrel cage induction type, totally enclosed frame construction, and may be fan-cooled, blower-cooled, or non-ventilated. Winding insulation shall be Class F or H and the temperature rise of the motors furnished shall not exceed that permitted by the applicable NEMA Standards for the class of insulation used. Each motor shall have a horsepower rating sufficient to meet the respective operating requirements specified without exceeding its rated full-load torque. Motor bearings shall be of the anti-friction, pre-lubricated type requiring no addition or change of lubricant for a period of at least 5 years. Pressure lubricating fittings may be used provided the housings are properly vented to prevent damage to the seals. The design of the motor housing and method of assembly shall permit ready removal of the end brackets and prevent escape of lubricant and entrance of foreign materials.

Motor time ratings shall be not less than the following:

Main hoist motors	Continuous
Aux. hoist motors	Continuous
Trolley travel motors	60 min.
Bridge travel motors	Continuous

2.5.1 Motor Size and Speed

The size (HP) and speed (RPM) of the new motors shall be the same as the existing motors.

2.6 ELECTRIC HOLDING BRAKES

2.6.1 General

Each hoist motor shall be provided with two electric holding brakes, one mounted on the motor shaft and one on the reducer shaft. One electric holding brake, mounted on the motor shaft, shall be provided with each travel motor.

2.6.2 Type

The electric holding brakes shall be of the shoe type, spring set, with direct-current magnet release, and shall be arranged for Type I mounting as defined in NEMA ICS 8, if practicable.

2.6.3 Torque Rating

Hoist brakes shall have a factory-adjusted torque rating not less than 125 percent of the rated torque of the motor. Bridge and trolley travel brakes shall have a torque rating not less than full-load torque of the bridge and trolley motors. The torque rating of the brake shall be referred to the shaft on which the brake wheel is mounted, the efficiency of the speed reducer not being considered. The torque ratings shall be based on the following conditions:

BRAKE	TORQUE RATING
-----	-----
Hoist	Continuous duty
Bridge travel	Continuous duty
Trolley travel	1-hour duty

2.6.4 Release

Releasing magnets shall be of the direct-current shunt type. Direct-current shall be supplied by means of a rectifier and control unit of proper rating and suitable for operation on power supplied the crane. The complete unit (brake and rectifier) shall be suitable for connection to the control circuit or the AC power circuit of the motor with which the brake is used so that the brake will set or release when the motor is de-energized, or energized, respectively. A hand release which is self-resetting shall be provided. The hoist brakes shall be connected into the control system such that one brake will set after a small time delay. The time delay shall be adjustable and the method of accomplishment shall be subject to approval. The rating of the brake releasing magnet shall be sufficient to release and hold the brake in the released position with 80 percent of rated voltage impressed on the incoming terminals.

2.6.5 Adjustment

Suitable means shall be provided to allow varying the holding torque and adjusting the positions of the shoes to compensate for wear, unless the design is such that compensation for shoe wear is automatic. The hoist motor brakes which are rated at 125 percent of the rated motor torque shall be initially adjusted to give a holding torque equivalent to 100 percent of

the full-load motor torque.

2.6.6 Mechanical Construction

Except for brake base, brake wheels, shoes, shoe holders and electrical parts, no cast iron, unless of a type having acceptable structural properties as approved by the Contracting Officer, shall be used in brake construction. All allowed cast iron components, except electrical parts, shall be ductile iron. All pins, fittings and other miscellaneous small metal parts shall be of corrosion-resisting metal or shall be treated to render corrosion resistant by galvanizing; sherardizing; or plating with zinc, cadmium or copper. Bearings shall be fitted with bronze or other approved bushings to prevent any binding of moving parts. Antifriction bearings of corrosion-resisting construction may be used. Adequate means shall be provided for lubricating oil bearings, unless the bearings are of an approved self- or pre-lubricated type.

2.6.7 Designation and Markings

Nameplates shall be provided for each brake and attached to a part of the brake which ordinarily will not be renewed during its service life. Each nameplate shall conform to standard practice and clearly indicate the manufacturer's name, identification symbols, serial number, and salient design features such as type, frame, torque rating and voltage.

2.7 LIGHTING SYSTEM

2.7.1 General

The existing lighting fixtures and conduit system shall be replaced, and all lamps, outlets, and wiring shall be new. The completed lighting and outlet system shall comply with the requirements of this specification.

2.7.1.1 Lighting Transformer

The lighting transformer shall be a 480-120/240-volt, single phase, 60-Hz, dry-type, air-cooled, continuous-rated, two-winding transformer conforming to the requirements of NEMA ST 20.

2.7.2 Panelboard

One 480-volt and one 120/240-volt dead-front panelboard complete with buses, gutters, barriers, wiring and the following circuit breakers, as a minimum, shall be furnished and mounted in the operator's cab. Means shall be provided for locking each circuit breaker in the open position. The panelboards shall be in accordance with NEMA PB 1, and shall contain as a minimum the following items:

480-volt:

- 1 - Circuit breaker for control of crane movement circuits
- 1 - Circuit breaker for the 480-volt outlet
- 1 - Circuit breaker for the floodlights
- 1 - Circuit breaker for the line-side of the lighting transformer

120/240-volt:

- 1 - 20-ampere breaker for the crane control circuits
- 1 - 20-ampere breaker for control of operator's cab lights
- 2 - 20-ampere breakers for control of the convenience outlets
- 2 - 20-ampere spare breakers

2.7.3 Air Circuit Breakers

The air circuit breakers shall conform to the applicable requirements of UL 489 and shall be heavy duty type, I-T-E Type ET or Westinghouse Type AB De-ion circuit breakers or equal. Commercial air circuit breakers of the Westinghouse Quick-Lag Type, I-T-E Type EQ or Square D Type Q will not be acceptable. The air circuit breakers for 120 or 240 volts AC circuits shall be rated not less than 120/240 or 240 volts ac, and shall have a minimum NEMA interrupting capacity of 10,000 symmetrical amperes. The air circuit breakers for the 480-volt AC circuits shall be rated 600 volts ac, and shall have a minimum NEMA interrupting capacity of 18,000 symmetrical amperes at 600 volts AC.

2.7.4 Working Area Floodlights

High-bay type lighting fixtures of shockproof construction for 400-watt metal halide, equal to Holophane Cranelite, shall be furnished and installed to light the working-area under and adjacent to the crane. The method of mounting the working-area lights shall permit relamping and maintenance to be accomplished from the catwalks or by lowering fixtures with Joslyn Thompson, or approved equal, hangers. Location of lighting fixtures shall be submitted and approved by the Contracting Officer. Transformers and ballasts shall be supplied as required to isolate the floodlights from the 480-volt system.

2.7.5 Cab Lights

Fixtures for 100 watt fluorescent fixtures with lamps, ballasts and shockproof type lamp sockets, equal to Holophane Cat. No. 7200-4, shall be provided in the operator's cab. The ballasts shall meet UL standards for Class P ballasts and operate within specifications over a temperature range of 0° to 100° C (32° to 212° F).

2.7.6 Convenience Outlets

Two convenience outlets shall be provided along each walkway on the main bridge girders, and two convenience outlets shall be provided in the operator's cab. All convenience outlets shall be connected to the 120-volt receptacle circuits in the panelboard and shall be GFCI type, duplex 125-volt, 20-ampere, 2-pole, 3-wire, polarized, NEMA configuration 5-20R, equal to Hubbell No. GF8300 (Hospital Grade), provided with cast metal receptacle housing with weatherproof caps and mounted on cast metal boxes. The receptacle housing and box shall be equal to Crouse-Hinds FS or FD boxes and provided with Hubbell 5206 type covers or equal.

2.7.7 Power Outlet

One 30 ampere, 480-volt, 3-phase, power outlet and box equal to Crouse-Hinds ARRH3482 shall be provided and installed on the crane walkway midway between the limits of trolley travel.

2.8 CONDUIT

2.8.1 General

Rigid steel conduit shall conform to NEMA C80.1 and shall be zinc-coated both inside and outside by hot-dip galvanizing method. Flexible conduit shall conform to UL 360, shall have a hot-dip galvanized steel core, copper ground wire and a waterproof extruded PVC cover.

2.8.2 Fittings

Fittings for rigid and flexible conduit shall conform to NEMA FB 1, UL 467, and UL 514B. Fittings for rigid conduit shall be threaded.

2.8.3 Outlet, Junction, and Pull Boxes

Sheet metal boxes and covers shall conform to NEMA OS 1, UL 514A, and UL 514B. Cast boxes and covers shall conform to UL 514B and UL 886. All cast boxes shall be supplied with integral cast hubs or with factory-brazed hubs. All hubs shall be factory threaded.

2.9 INSULATED WIRE AND CABLE

2.9.1 General

Materials, construction and tests, unless otherwise specified, shall conform to the applicable requirements of NEMA WC 57 or NEMA WC 70, as applicable. Parts, tables, sections, appendices, grades and classes specified will refer to the above NEMA Standard, unless otherwise stated. Unless otherwise specified or approved, all wire and cable for power, control and lighting shall be single conductor. Wire for power and motor circuits shall have a current carrying capacity of not less than the full-load current of the motor or the circuit but in no case less than No. 10 AWG. Wire for control circuits shall not be smaller than No. 14 AWG. Wire for lighting circuits shall have a current carrying capacity corresponding to the ampere rating of the circuit's air-circuit breaker, but in no case less than No. 12 AWG. Wires exposed to heat or in resistor cabinets shall be sized as required but in no case less than No. 10 AWG.

2.9.2 Conductors

Conductors shall conform to all the applicable requirements of Part 2 of NEMA WC 57, or see Section 2 of NEMA WC 70 and shall be annealed copper wire. Copper conductors shall be tin or lead alloy coated, or bare, as required by the type of insulation used.

Conductors shall be solid or stranded as required below:

- a. Power and Control Circuits. Conductors shall have Class B or C stranding.
- b. Lighting Circuits. Conductors of No. 10 AWG and smaller shall be solid, and conductors of No. 8 AWG and larger shall have Class B stranding.

2.9.3 Insulation

Insulation shall be a cross-linked polyethylene meeting the dimensional,

electrical, and physical requirements of Part 3 of NEMA WC 57 or Section 3 of NEMA WC 70. Type I or Type II grade of EPR insulation shall be used for single-conductor cables with a jacket and for the individual conductors of a multiple-conductor cable with an overall jacket. Insulation thickness shall be as required by Table 3-1, Part 3 of NEMA WC 57 or Table 3-4 of NEMA WC 70 as applicable, for rated circuit voltage of 0-600 volts. Single conductor cross-linked polyethylene insulated cable with NEMA WC 70, Part 3, Table 3-4, Column "A" thickness only will be permitted without a jacket. Single-conductor cables shall have jackets when insulation thicknesses are in accordance with Column "B", Part 3, Table 3-4 of NEMA WC 70.

2.9.4 Jackets

An outer jacket of a synthetic thermosetting material shall be applied over multiple-conductor cables. Single-conductor cables and individual conductors of a multiple-conductor cable may have a jacket. The jacket shall be tightly and concentrically formed around the core of the cable.

The jacket shall be one of the materials listed below in accordance with the applicable paragraphs of NEMA WC 57 and NEMA WC 70. Polyvinyl chloride compounds will not be permitted. Variations from the materials required below will be permitted only if approved for each specific use, upon submittal of sufficient data to prove that they exceed all specified requirements for the particular application.

- a. Neoprene, heavy-duty black.
- b. Chlorosulfonated polyethylene, heavy-duty.
- c. Chlorinate polyethylene, cross-linked, heavy-duty.

The outside diameter of single-conductor wires and multiple conductor cables shall not vary more than 5 percent and 10 percent, respectively from the manufacturer's published catalog data.

2.9.5 Wire Near Resistors

Wire exposed to heat shall be Type SF-2.

2.9.6 Control Panel Wiring

Control panel wiring shall be stranded copper switchboard wire with 600-volt insulation type SIS. Hinge wire shall have Class K stranding. Hinge wire shall be used between stationary and hinged equipment and shall be formed in wire loops or bundles at least 750 cm (24 inches) long which shall provide rotation around the longitudinal axis of the conductors.

2.9.7 Linked Carrier System

The connections to the trolley shall be made using Type G cables with 75° C (167° F), 600 volt insulation and heavy-duty "Neoprene" jacket for the power circuits and type SO cord with 60° C (140° F), 600-volt insulation and "Neoprene" jacket for control and lighting circuits. Type G cables and SO cords shall conform to the applicable requirements of NEMA WC 3, Part 7, paragraphs 7.6 and 7.7, respectively. Conductors shall have not less than Class H stranding.

2.9.8 Fire Resistance

All cable for multiple-conductor and single-conductor assemblies shall pass, or be capable of passing, the flame test of IEEE 383, paragraph 2.5, using the ribbon gas burner. Single conductors and individual conductors of multiple-conductor assemblies shall also be required to pass the flame tests described in NEMA WC 57, paragraph 6.16 and NEMA WC 70, paragraph 6.8.

2.10 TERMINAL BLOCKS

Terminal blocks, where required, shall be molded type with barriers, rated not less than 600 volts, similar to General Electric Company Type EB-25 or Marathon Electric Manufacturing Corp. Series 1600, or approved equal. The terminal shall be removable binding, fillister, or washer head screw terminal, or stud type with contact and locknuts, and not less than size No. 10, having length and space for connecting at least two indented terminals on No. 19/22 AWG conductors to one terminal. White or other light-colored plastic marking strips, fastened by screws to the molded sections at each block, shall be provided for circuit designation. Each connected terminal of each block shall have the circuit designation or wire number neatly printed on the marking strip with durable marking fluid. One reversible or one spare marking strip shall be furnished with each block.

PART 3 EXECUTION

3.1 EQUIPMENT REMOVAL

Remove all electrical control equipment, motors, brakes, conduit (unless reused), wire and cable, conductor system (including mounting brackets), and the four high bay incandescent light fixtures. The operator's cab is to be removed as a unit. All equipment removed shall become the property of the contractor.

3.2 EQUIPMENT INSTALLATION

3.2.1 General

All work shall be installed as shown and in accordance with the manufacturer's recommendations, unless otherwise specified. All necessary interconnections, services, and adjustments required for a complete and operational system shall be provided. Electrical work shall be in accordance with NFPA 70.

3.2.2 Manufacturer's Technical Services

Equipment manufacturers shall make available the services of a competent installation technician during installation, startup, and testing. The technician shall have the responsibility of checking the installation and making any field adjustments necessary to obtain a working system within the applicable requirements. The manufacturer's representative shall also be responsible for supervision of all testing and for providing system training.

3.2.3 Conduit

All wiring between equipment units or components shall be installed in rigid, hot-dip galvanized steel conduit, except that liquid-tight flexible conduit may be used for short connection when so approved by the Contracting Officer. The conduit shall be securely mounted and installed

in a neat and workmanlike manner. Conduit shall not be run on top of girders or walkways and, except where necessary, shall not be exposed to view from the powerhouse floor. Conduit junction boxes, cover plates, and fittings shall be galvanized cast or malleable iron, cast aluminum, or cast brass. Turns shall be made by means of conduit fittings, in order that the conduit may fit close to the crane framework, and all joints shall be threaded and all terminations at equipment units or components shall be made by lock nuts and bushings or shall be threaded. Conduit unions shall be used to join conduit where standard couplings cannot be used. No running threads will be permitted. Ends of conduit shall be carefully reamed. Separate conduit systems shall be provided for power, control and lighting circuits. The entire conduit system shall be grounded. No conduit smaller than 2 cm (3/4 inch) size shall be used. All mechanical work of installing the conduit shall be complete before installing wire.

3.2.4 Wire and Cable

All conductor connections, except for splices in lighting conductors which are made in junction boxes, shall be terminated at terminal studs or terminal blocks using approved indented terminal connectors of the ring-tongue type which are equal to "STA-KON" type as manufactured by Thomas and Betts Co. All screw type terminals shall have lock washers and all stud-type terminals shall have contact nuts and either locking nuts or lock washers. No splices shall be made in any wiring on a panel or in a conduit. Single conductors and individual conductors of cables shall be identified with non-metallic tube-type wire markers at each termination. Tubing shall be sized to fit the wire and shall be uniform in position. The tubing shall be stamped with black wire numbers as indicated on the drawings. Multiple-conductor cables shall be identified with cable designation by embossed aluminum band markers at each termination.

3.3 ELECTRICAL TESTS

3.3.1 General

Each item shall be tested, as required below, to determine if the item is free from electrical and mechanical defects and conforms to the requirements of the specifications. All tests required herein shall be witnessed by the GQAR, unless waived in writing, and no equipment shall be shipped until it has been approved for shipment by the GQAR. The Contractor shall notify the GQAR two weeks in advance of the date of the tests, so that arrangements can be made for the GQAR to be present at the tests. The test equipment and the test methods used shall conform to the applicable requirements of ANSI, IEEE and NEMA standards, and shall be subject to the approval of the GQAR. The Contractor shall furnish five certified copies of the reports of all tests recording all data obtained during any given test. Certified copies of the results of the performance and speed-torque tests for duplicate motors will be accepted in lieu of requiring these tests to be repeated. The cost of performing all tests shall be borne by the Contractor and shall be included in the price bid.

3.3.2 Electric Holding Brakes Tests

Each electric holding brake shall be given the following tests:

- a. Operation of release with 80 percent of rated voltage applied to the incoming terminals of the rectifier.
- b. Resistance measurement of DC operation coil.

c. Dielectric.

3.3.3 Control System Equipment Tests

Each of these items shall be tested in accordance with NEMA ICS 1.

3.3.3.1 Controller

Controllers shall be given the following tests:

- a. Adjustment, fit and material.
- b. Successful or general operation.
- c. Resistances.
- d. Dielectric.
- e. Insulation resistance.

3.3.3.2 Limit Switches

Limit switches shall be given the following tests:

- a. Adjustment, fit and material.
- b. Accuracy of trip and reset.
- c. Successful or general operation.
- d. Dielectric.
- e. Insulation resistance.

3.3.4 Motors

Each induction motor shall be given the standard routine and performance tests as specified in NEMA MG 1. Performance curves indicating the results of these tests shall be furnished as follows:

- a. Performance Test. Torque or percent of rated horsepower output as abscissa vs. efficiency, power factor, amperes, watts and rpm or percent slip as ordinates.
- b. Speed-Torque Test. Torque as abscissa vs. speed in rpm or percent of synchronous speed as ordinates.

3.3.5 Wiring Tests

After installation, but just prior to terminal connection, each conductor shall be tested as follows:

- a. A 1000-volt "Megger" test shall be performed with all other conductors in each conduit grounded. The final insulation resistance of each conductor shall not be less than one megohm.
- b. A continuity test of each conductor from terminal to terminal shall be performed and a phase identification check of power conductors shall be made.
- c. Test data shall include "Megger" readings, results of the continuity test, and conductor identification markings.
- d. Any length of wire and cable failing under the above tests shall be replaced.

-- End of Section --